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COLLECTIVE REVIEW

THE TREATMENT OF INJURIES OF THE SPINAL CORD

JOHN MARTIN, M.D., F.A.C.S., Chicago, Illinois

DURING the decade just past there has been a mounting interest in the problem of the patient with traumatic paraplegia, and the literature has been swollen with the opinions of general surgeons, orthopedic surgeons, neurosurgeons, neurologists, pathologists, and physical therapists, as well as of those interested in the complications of these injuries, such as the plastic surgeons and urologists. The record attained in the treatment of these patients in World War I is not a very enviable one, and it is quite apparent that the methods of treatment of traumatic paraplegia were not improved by the rich experience of that war. In the succeeding years the majority of the patients were injured in industrial or traffic accidents, and the greater part of the injuries were of the closed, fracture-dislocation type. With the advent of World War II and its tremendous number of patients with injuries of the spinal cord from every conceivable cause, a second opportunity for improvement in methods of treatment was at hand. To judge from the number of reports alone, one must conclude that a renewed interest in the subject of traumatic paraplegia has arisen out of the earnest effort of the medical corps of the United States Army and Navy to meet the challenge of the care of these tragically injured patients. It is quite apparent, as might be expected, that *all* military care was not ideal; it is also apparent that the civilian standards of care have left and still do leave much to be desired. The present literature is not 100 per cent assuring, but the current general methods of treatment are for the most part in accord; they are based on sound surgical principles and a knowledge of physiology; and they have been matured by the recent experience of the war.

This review has to do with the subject of treatment only, and is concerned only with those patients in whom the spinal cord or cauda equina was injured, and not with spinal injuries alone. The literature from 1936 to 1940 is noteworthy for its paucity of new ideas or fresh statements. However, with the war there came a deluge of reports, some good, many bad, but all with undeniable fervor. Many authors have made the mistake of prefacing an otherwise good paper with long and tedious accounts of the anatomy and physiology of the vertebral column and the spinal cord—an undertaking invariably better handled by the average text of anatomy. Over and over again the reader is forced to review the mechanism of the flexion injury, to look at time-worn diagrams and reproductions of roentgenograms. One encounters hobbies which have been ridden until they are irritating. But the whole composite, taken, sifted, and digested, is bound to leave the reader with something new, appealing, useful, and hopeful.

One encounters at every turn in the expressions of all authors the same recurring questions. When shall decompressive laminectomy be done? What are the criteria for operation? How can the spinal deformity be best reduced, by the closed method such as the Taylor method, or by the traction methods with a chin halter or the Crutchfield tongs in the cervical injuries? Are casts ever to be used when there is severe neural injury? Of what prognostic value are the reflexes? What are the

From the Department of Surgery, Northwestern University Medical School, Chicago, Illinois. A review of the literature from 1936 to 1946.

disasters resulting from the transportation of the injured patient, and how are they to be avoided? How long must the injured spine be immobilized in the various types of fractures? (Opinions vary from 6 weeks to 12 months). What is the best method for the care of the paralyzed bladder? How far should surgery go in the correction of spasticity, spasms, and pain? Is surgical repair of the cauda equina feasible? To judge from the lack of agreement between writers whose opinions must be respected, one would at first gain the impression that nothing new is gained, nothing old has been solved. Yet that is not the case. The treatment of the paraplegic patient has improved immeasurably during the past 10 years, and it is still improving.

THE EARLY PHASE OF TREATMENT

First aid; transportation. "The management of a patient who has a spinal injury should begin at the scene of trauma" (78). "Proper early care depends upon proper early diagnosis" (12). These and many other authors (1, 11, 21, 22, 51, 57, 59, 76, 80, 82, 91, 100, 115) have stressed the importance of intelligent early treatment of the patient with an injury of the spinal cord. Well-intentioned but bungling first aid workers, resuscitating squads, anxious relatives, policemen, and even bystanders at the scene of an accident may, by their improper handling of the patient, add irreparable damage to an already injured spinal cord by their insistence on "doing something for the injured person." As in any other serious injury, there is seldom great need for special haste in moving the patient, and care mixed with emotional stress is likely to result in further disaster. Palmer pointed out that any unconscious patient who may have received a spinal or spinal cord injury should be treated exactly as if he were known to have been so injured, until the actual extent of injury can be ascertained, and others, as Thomson, have warned against the danger of increasing the jackknife deformity by lifting the patient improperly or without sufficient help. The simple instruction stated by Davidoff, that the first point of emergency treatment is to leave the patient flat on the ground, right where he originally lay, until proper help and means of transportation are available, is perhaps the most important and altogether sane procedure that can be advised, for Davidoff, as the others, is most concerned with the additional trauma that can be caused by loosened vertebrae and bone fragments when the patient is moved It is stressed by many who have had the early care of such patients that at least 3, and preferably 4, persons are required to lift the patient with an injured spine, and if there is injury to the cervical spine or cord, an extra person is needed to hold the head in a fixed, slightly extended position throughout all the maneuvers of moving.

Many patients with recent fracture of the spine, with or without cord injury, suffer severe root pains at the segment of injury. Authors are disagreed upon the subject of administration of morphine to relieve the pain. Coleman and Pilcher (78) state: "Morphine sulphate should be given without hesitation in dosage (0.016 gm. or ¼ gr.) sufficient to bring relief of this pain". Knight, McAlpine, and others agree to such medication. Others, however, as Wortis and Sharp, made special admonition against such medication, and Davis (22) stated: "Morphine should not be given to patients with injuries to the cervical spinal column". It would seem best, everything considered, to avoid morphine if other measures to allay the pain can be found, for certainly patients with injuries to the cervical cord, especially, may already have respiratory difficulties which would only be increased by morphine in sufficient dosage to stop the pain, and, furthermore, such medication may mask other important neurological signs. Root pains are most likely to occur in cervical spine injuries; fortunately, this is the portion of the spine most easily handled by traction, and it is the usual thing to see a patient immediately relieved of his root pain as soon as adequate traction is applied to pull the involved vertebrae apart.

The subject of the position of the patient while in transit from scene of accident to the hospital has been a matter of detailed description as well as of disagreement among many surgeons. Why there should be disagreement is a strange thing, since it would seem obvious, (as it has to many experienced men) that the preservation of the anatomical position, with fixation and immobilization by temporary means at the level of injury, is the all important consideration. Thomson was so concerned that the jackknife deformity be not further increased that he advised the transportation of all patients with spinal injuries in the prone position, apparently even advising this for cervical injuries. Platt, on the other hand, believed that patients with cervical injuries should be transported in the supine position, with the neck immobilized, but that in all other spinal injuries the patient should be transported prone, except that when there are chest injuries or when the fracture is a lower lumbar one the patient should lie face up with proper support under the lumbar curve. McAlpine advised the prone position for lumbar injuries and the supine position for cervical in-

juries, in either case immobilizing the spine at the level of injury and adding extra support to maintain the normal points of curvature. Knight recommended the prone position, either on a blanket or stretcher, to maintain hyperextension of all parts of the spine. Other authorities (76, 100) recommend the supine position for all methods of transportation. The majority of neurological surgeons insist upon the supine position, on a rigid support as a firm litter, plank, or other unyielding surface. Such a position allows satisfactory examination, does not interfere with the treatment of chest or abdominal complications, permits the maximal respiratory excursion for the patient, and, with the cervical and lumbar spine supported with a roll of clothing or blanket, keeps the proper position of moderate hyperextension. Davis (22) stated the problem tersely, and is here quoted:

"The most important principle in the emergency treatment of fracture-dislocations of the spine is to do nothing which will increase the bony deformity. The patient should not be moved unless it is absolutely necessary because each new movement may cause bony fragments to cut into the spinal cord. The patient's head should not be raised to give him a drink or cigarette. A rolled blanket or pillow should not be placed beneath the head. He should not be lifted off the ground unless he is on a litter or other rigid support. Reduction should not be attempted. Plaster casts should not be applied. The patient with a fracture dislocation of the cervical spine is in the optimum position when he is lying on his back, with a folded blanket 3 to 4 inches thick beneath his shoulders, with his head below the level of his shoulders and his neck in slight dorsiflexion (hyperextension). Folded blankets should be secured at both sides of the head to prevent lateral movement. He should not lie face down with his neck twisted, nor upon his side with his neck flexed laterally. Care should be taken that clothing and blankets are smooth beneath the patient. Pockets should be emptied. Three persons are needed to turn properly a patient with a fracture-dislocation of the neck onto his back from some less favorable position. One should grasp the chin and occiput and exert steady traction in the line of the long axis of the body. The second should grasp the ankles and exert equal countertraction along the same line of pull. The third should then kneel beside the patient, reach across his body and grasp the patient's clothing near the shoulder and near the hip joint with his 2 hands. He should then gently rotate the patient toward himself while the men at the head and feet exert their traction. The head, neck, body, and legs should be so placed on the ground or the litter that the patient's shoulders finally come to rest on top of it when rotation has been completed. This position will allow the head to hang down slightly and permit a moderate dorsiflexion (hyperextension) of the cervical spine, a position which tends to correct the deformity caused by the fracture-dislocation. If the patient is lying face upward on the ground, the 3 men should take the same position as for turning him, with the exception that the man at the side should grasp the patient's clothing on the side nearest to himself. The 3 men should then gently slide the patient from the ground onto the litter without lifting him. The 2 men at the head and feet should meanwhile maintain a strong longitudinal traction.... The fundamental principles for the emergency treatment of compression fractures of the lumbar spine are essentially the same as for fractures of the cervical spine; the patient should not be moved unless it is absolutely necessary. He should not be picked up and carried from one place to another unless he has first been placed upon a litter or other rigid structure. There are two acceptable positions for a patient with a compression fracture of the body or one of the lumbar vertebrae. If an air mattress is available, the patient should be placed upon it, lying upon his back, with 2 or 3 folded blankets underneath the air mattress at the site of the fracture so placed as to produce hyperextension of the spine. If an air mattress is not available, then the best position is the face-down position. This position automatically prevents further anterior flexion of the lumbar spine.... No other attempts at correction of the bony deformity should be made.... The principles involved in turning a patient with a compression fracture of the lumbar spine are similar to those for turning a patient with a fractured cervical spine, except that in fractures of the lumbar spine, traction by the man at the head of the patient may be applied under the armpits. In transferring the patient from the ground to the stretcher the same principles apply as in the case of a patient with a fracture-dislocation of the neck."

Munro (70) advised the face-down position for the transportation of the patient with an injury of the cervical spine, and he agreed with most others that at no time should manual reduction of the injury be done at the site of the accident. Clark advised the earliest possible manual reduction of fracture-dislocations of the cervical spine at the scene of the accident, since he feared the ill effects of transportation on the unreduced spine and the adjacent injured cord. This is the one instance in which such early reduction is advised. Raaf has

found useful the immediate application of the Schreiber pneumatic collar before the patient with a cervical injury is started on his way to the hospital.

Spinal shock. This term has been rolled about loosely, frequently to the confusion of the reader. Certainly any patient with an injury of the spinal cord, with or without concurrent injury of other parts of the body, may suffer from shock as it is usually known, with a fall in blood pressure, a low body temperature, a poor pulse, and evidence of poor peripheral circulation. Obviously, the usual supportive measures for such a condition must be instituted before any form of active treatment can be begun. Kennedy decried the use of the term, calling it inaccurate and unjustified, and pointed out that early in the phase of spinal cord injury (during "spinal shock") nothing will prove the differentiation between a complete anatomical and complete physiological lesion other than direct inspection. Spinal shock is usually taken to mean that period following injury when the patient is completely flaccid and without reflex response of any type below the upper level of his injury, and when cord function is completely lacking. Elsberg has stated that plantar flexion of the great toes is usually the only reflex movement that can be elicited upon scratching the sole of the foot during the first few weeks after complete transverse lesion of the spinal cord, and that the appearance of the Babinski sign within the first 2 weeks after injury is evidence of the incompleteness of the lesion. However, the appearance of reflexes, either flexor or extensor, does not necessarily always coincide with the change from flaccidity to spasticity; and many authors would prefer to apply the term "spinal shock", for whatever indications it might have (and they are probably few) relative to surgical care, to that period of the first 2 to 4 days after injury when the patient is completely flaccid and without any response of any sort below the level of the lesion. At best, the term does not seem a very useful one for its indications as to care or prognosis. Kennedy believed that it is absurd and should be discarded.

THE PHASE OF ACTIVE TREATMENT

Clinical examination; the Queckenstedt test; x-ray examination. There is general agreement that the earlier the patient is examined and the extent of his injuries determined, the better it is for all concerned. Neurological surgeons and neurologists are interested primarily in the nature and extent of the neural injury; general and orthopedic surgeons are usually concerned with the bony deformity and the problem of its correction. Some of either group are capable of combining these interests in the proper proportion. Davis (21, 22), Coleman and Pilcher (78), Oldberg and other neurological surgeons insist upon the early neurological examination of the patient, without undue manipulation of his body, and point out that such examination must be recorded so that subsequent examinations can be compared with the first findings. Spinal puncture with performance of the Queckenstedt test to determine the presence or absence of a block of the spinal fluid is usually done when the cord injury is attended by obvious spinal deformity, whether the surgeon is opposed to operative treatment or not. Davidoff, Davis (21, 22), Stuck (109, 110), Wortis and Sharp, and others believe that a positive Queckenstedt test, along with other findings, may be one of the criteria for laminectomy; but apparently no author believes that the presence of a block alone is sufficient cause for open operation when there is evidence of complete loss of cord function. Wortis and Sharp state that "spinal tap should be performed and, if manometric block is present and the clinical signs increase (in the case of the incomplete cord lesion), decompressive laminectomy is indicated. This group is the only one in which spinal fluid manometric studies are of value. We do not believe that routine spinal taps in all cases of acute fracture of the spine are necessary. Only those patients should have lumbar puncture manometric tests who, it is believed, can be helped by operation. . . . The procedure has definite risk associated in the act of moving the patient." Pilcher believed, also, that when the lesion was apparently incomplete, a positive Queckenstedt test together with x-ray evidence of compression constituted an indication for laminectomy. Mayfield and Cazan do not put much dependence in the Queckenstedt test, nor do they believe when it is positive that it is a good indication for laminectomy. It is not infallible because, as Poppen and Hurxthal showed, the response to jugular compression will be normal so long as the lumen of the subarachnoidal space is not less than the bore of the needle. Therefore, severe pressure may be present on the cord and still not show a complete block. "We would consider laminectomy indicated in compression injuries of the cord only if there was an incomplete lesion and the patient were showing progressive loss of function, and the loss of function could not be arrested by closed manipulation" (58).

It is no surprise or secret that even the best of x-ray pictures of the injured spine may by no means show all the injury present, or the presence of such important factors as spicules of bone which

have been driven upon or into the cord. While it is the general concensus that careful and early roentgenological study of the injured spine is in order in every case of spinal cord injury, no author has stated that evidence of bony damage by such examination constitutes alone an indication for open operation. It may, however, be an accurate guide to methods of closed reduction of the spinal injury. Kennedy noted that "x-rays of the spine are by no means conclusive of fracture of the laminae or the spines", and quoted Browder and Miner as follows: "Negative x-ray findings do not necessarily exclude the possibility of a bone lesion." Jefferson (44) made the important observation that flat plates were not sufficient; when the injured spine is x-rayed, stereoscopic antero-posterior views should always be taken. Portable or other bedside films are usually of such poor quality that they will give only an approximate estimation of the bone injury, although they have been found useful by all surgeons when the views are taken in a lateral position in cervical injuries to determine quickly and with little movement of the patient the presence and extent of a cervical fracture-dislocation. They are useful, too, after methods of closed reduction have been applied, to follow the course of the patient from day to day as he remains in position in his bed. However, if operative indications depend heavily upon the extent and nature of the bone injury, then the patient should be carefully studied by means of x-rays on the regular x-ray table fitted with a Buckey apparatus, and the pictures should be taken with as little movement as possible. Usually such films are made while the patient is on his way to the operating room, so that little additional movement is necessitated in obtaining these pictures.

Closed reduction and conservative care vs. laminectomy. With but very few exceptions most surgeons agree that treatment of the patient with a spinal cord injury should be delayed until he is out of his primary shock and in condition for whatever treatment may be necessary. Until that time, he is given supportive care and maintained immobile without any attempt to correct the spine from its position when the patient was first found injured. All spinal injuries, with or without cord injury, should be corrected if possible. Packard stated: "All fractures with deformity should be corrected whether cord injury is present or not. If cord injury is present correction reduces pressure. If cord injury is not present, deformity is still undesirable as it produces a faulty weight-bearing line, chronic pain, and disability." As Ruth pointed out, hyperextension is not a cure-all for injuries of the spine. Emergency, and therefore sometimes hysterical, attempts at hyperextension of the freshly injured back may do as much damage as flexion would do. In accord with the nature of the injury, hyperextension may force backward upon the cord a displaced articular facet or fractured lamina and add an injury which did not originally exist. Ruth believed that there is a tendency in injuries of the spine for the parts to assume normal relationships, and that maximum distortion occurs at the instant of the impact, the parts thereafter immediately springing back until their return is checked by abnormal bony impingement. Therefore, x-ray examination rarely shows the maximum amount of displacement that occured at the moment of injury, for it is, no doubt, at the very instant of impact and fullest distortion that the cord receives its maximum injury, sometimes quite out of keeping with the later mild or absent signs of bone injury. For that reason Ruth believed that hyperextension should not be done until all means of full treatment are at hand and the exact nature of the bone change has been determined. Rather, the spine should be stabilized in its original post-traumatic state so far as early care is concerned.

Every author has his favorite method of effecting closed reduction. Johnson, along with many others (11, 25, 41, 46, 112), favors the Walton or Taylor method of closed manipulation for the reduction of spinal fractures, even in the cervical region, together with the use of such special apparatus as the Bradford frame, the Goldthwait frame, various types of hammocks and slings, and plaster immobilization. Jefferson (44) stated that he believed that to reduce cervical dislocations by such means was by no means a guarantee that the injury would stay in proper alignment, since the torn supporting ligaments frequently allow dislocation to recur. Morrison pointed out that while reduction and fixation in hyperextension were in many cases the proper treatment, hyperextension is contraindicated (1) when there are obviously torn anterior vertebral ligaments, (2) when there are fractures of the elements of the posterior arches, and (3) when fractures associated with known cord damage will lead to open operation. Many writers have pointed out the danger of exerting hyperextension and applying a body jacket with a pad over the site of injury when the thoracic cord has been injured and fractures are present in the posterior spinal elements at the level of the lesion. By so doing, they stated, the loose bone fragments may be forced down upon the exposed, swollen cord which is subject to further injury with but very little effort. Voris indi-

cated that manipulation with the patient under anesthesia probably gives a higher mortality than laminectomy, and that it is a dangerous procedure in that further cord damage may result. Stuck (109, 110) stated: "Manipulation of the spine under an anesthetic, which has been advised for fractured vertebrae, is contraindicated because of the danger of further cord damage." He recognized that the early care of the patient may be entirely orthopedic in nature, but insisted that if the injury were cervical, the reduction should be accomplished by means of the Crutchfield tongs with the neck in hyperextension, whereas if the injury were thoracic or lumbar, reduction should be accomplished by means of the proper cast or a hyperextension bed frame. Gallie, apparently speaking from experience, stated: "Efforts to reduce the dislocation by manipulation are attended by such appalling risk of damage to the spinal cord that they should not be employed. I saw one such disaster, and it was enough." Sammons saw no special value at any time in the operative treatment of compression fracture of the spine with a transverse lesion of the cord, but did believe that reduction by the closed method should be obtained early. He added, "Modern methods of reduction of fracture-dislocation have entirely supplanted laminectomy." That latter statement, however, is not fully in accord with the majority of neurological surgeons, when one considers all the factors which must be gone over in arriving at the decision to operate or not to operate.

Most authors agree that the final position of the patient with an injury to the thoracic or lumbar spine, with or without cord injury, and whether or not subjected to laminectomy when the cord has been injured, should be that of hyperextension, with fixation either on a special hyperextension bed with a reverse spring mechanism or by means of rolled blankets under the mattress and without a plaster cast (the methods most often used by the neurological surgeons), or with fixation by means of a plaster cast sometimes extending as far as the knees (the methods employed by some orthopedic surgeons). Most surgeons agree that plaster casts make many problems of nursing care, contribute to the formation of bedsores, and frequently add to the general discomfort of the patient; but then, apparently some surgeons regard these complications as the natural and expected outcome of spinal cord injuries, especially the development of bedsores.

Aside from the advocates of the closed manual method of reduction of cervical fracture dislocation, most authors are agreed that some form of skeletal traction is preferable in the care of these seriously injured persons. Munro and Wegner (73) have used the Hoen method of putting piano wire under the calvarium at the vertex and attaching weights thereto, but they found the method unsatisfactory and prefer to use simple halter chin-occiput traction with no more than about 5 pounds of weight; however, this must be used over a period of from 5 to 6 weeks. They apparently do not use the Crutchfield tongs. Sucha also tried the Hoen method and discarded it because of its dangers and complications; he now uses the original clevis type of skull tongs. Peyton, Hall and French described a method of inserting fish hooks under the zygomatic arches and applying traction, pointing out its simplicity of application and its effectiveness because the use of heavy weights was possible. However, in the hands of most neurological surgeons, and apparently also in those of an increasing number of general and orthopedic surgeons, the use of the Crutchfield tongs (17) has proved the simplest, most effective, and safest method of treating fracture-dislocations of the cervical spine. It has been the common experience of all surgeons using this method that the application of the tongs is a minor procedure quickly carried out without manipulation of the patient, weights up to 25 or 30 pounds can be applied for reduction of the more severe injuries, reduction is usually obtained early, and the patient is immediately relieved of local and root pains upon application of the weights. This method allows the free movement of the patient's body for nursing care, does not interfere with his eating, and does not subject him to all the well known annoyances which halter traction (so much less efficient in the hands of most surgeons) causes the patient who must wear such a contraption. It has become standard practice to apply traction early in cases of fracture-dislocation of the cervical spine when there is no open wound and when there is no evidence of indriven bone spicules or other foreign bodies. The method was used extensively in the military hospitals during the war just past, and repeated accounts of its use and the enthusiasm of the surgeons will be found in the reports of cord injuries in the Army and Navy journals.

The great bone of contention, however, in the treatment of injuries of the spinal cord concerns the problem of when, if ever, laminectomy is to be performed. Almost every reference furnished with this review will be found to voice the author's individual opinions regarding the wisdom of performing decompressive laminectomy. Browder and Grimes, Davidoff, Davis (21, 22), Elsberg, Fay, Jefferson (44, 45), Kennedy, Denker and Osborne, Love, Mayfield and Cazan, Munro (65–

73), Naffziger, Coleman, Meredith and Pilcher (78, 13), Oldberg, Pool, Rand, Scarff (102), Spurling and Bradford, Stookey, Voris, Wortis and Sharp, and various medical authorities concerned with military medical problems (113), together with others experienced and well known in the field of neurological surgery and all well aware of the problems of the traumatic paraplegic patient, have clearly stated their stand and all with good logic. Yet, as will be seen later by comparison with the opinions of urologists on the care of the paralyzed bladder, authorities disagree. The older neurosurgeons with a background of sound experience have as a group settled down to a not-too-hopeful, most realistic, and not by any means colored with optimism attitude. Many of them have had experience with both the military and civilian types of injuries, and therefore have dealt with both the open and closed types of injuries. The younger surgeons, especially those who saw many patients with both types of injuries, but predominately those with the open type during foreign service in the war just past, have a much more hopeful and enthusiastic regard for the possibilities of early surgery. Perhaps their hope is based on insufficient experience; but it is also possible, as indicated in a recent report by Tinsley, that their hopes are well grounded and that their willingness to tackle the problem with unbiased enthusiasm will initiate a new attitude on the part of neurosurgeons in general. The older surgeons say, in brief, "The damage is done; why prolong the show?" The less pessimistic surgeons say, "Nothing was ever gained by *laissez faire;* give the patient the benefit of the doubt." Naffziger stated that "with evidences of a complete lesion which persist for 24 hours after injury, surgery is probably of no benefit and permanent paralysis is expected." He pointed out, however, that the surgeon must not overlook the difference between cervical and thoracic cord injury, and injury to the cauda equina, the last being of the peripheral nerve type and therefore much more amenable to surgical treatment. Rand, among the older and more experienced group, is more lenient toward operation although yet not misled by undue optimism. He stated: "There is a certain psychological angle to be taken into consideration. Almost every patient with a broken back and paralyzed legs comes to feel sooner or later that he should have an operation. Therefore, even though it offers very little, laminectomy may be carried out in order that he may feel that nothing has been overlooked. I have often felt that if I had broken my back and become paraplegic, I would prefer that the spinal cord should be explored. The same question recurs every time I see one of these unfortunate individuals." Cases are on record in which patients with a complete transverse lesion of the cord persisting more than 24 hours before surgery have regained partial recovery after surgical decompression when block and compression existed, although the opinion has been stated by Naffziger and others that damage is *damage irrevocable* in the spinal cord, and that any recovery that comes about after surgery would most likely have appeared eventually even without the operation. Certainly, decompressive laminectomy weeks and months after injury rarely offers any benefit when evidence of a complete transverse lesion has persisted. This is not true, according to various case reports, even in the late operations when the lesion has been incomplete and not progressive. Early or late, operation has much more to offer in injuries of the cauda equina than it does in injuries of the spinal cord. Even those who advocate routine laminectomy as soon as primary shock is over admit that the chances are that little, if any, recovery will follow a decompressive operation if the patient has a complete lesion at the very beginning, since it is the general consensus that the instant of impact was the moment when damage was created to all practical purposes, and that pressure on an already irrevocably damaged cord cannot, therefore, add more injury. Others (33), feeling that in many cases anatomical and physiological lesions cannot be differentiated for the first few days even if the effect is one of complete functional loss, believe that operation should always follow when there is a block of the cerebrospinal fluid, even without (but especially with) x-ray evidence of severe bone injury. All neurological surgeons of experience agree that by general principle it is more allowable to operate in case of injury of the thoracic cord than when the injury is cervical. In the latter case, the effects of skeletal traction should always be tried first, and certainly it is generally agreed that early and premature cervical laminectomy, within the first few hours or days, is bad surgical judgment and is certain to be the one instance in which surgery contributes to the already poor prognosis of the patient.

In the closed type of injury, as for instance that resulting from fracture-dislocation in any level of the cord with an incomplete lesion, and either with or without evidence of bony compression, but especially with such cause for cerebrospinal fluid block, it is well to operate to allow every possible chance for the cord to recover. Certainly when there are signs of progression of neurological symptoms in the incomplete lesion, with evidence of compression, laminectomy should not be de-

layed. It has frequently been pointed out that after a few hours or days a complete block may exist in either the incomplete or complete lesion without any bone injury whatsoever, the block being due to edema of the cord at the level of injury. It has been the general experience that extradural extravasation of blood in significant quantity is a very rare complication. It has also been pointed out that a dissecting hematomyelia is a *fait accompli*, and is not reversible by surgery.

Open wounds, such as frequently occur in military casualties, require the usual wound care of débridement that all such wounds require. It was the common practice in the war just past thoroughly to remove all bone fragments and make a clean toilet of the wound, the dura in the potentially infected field never being opened. Indriven spicules of bone and foreign bodies, if accessible, were usually removed. The dural rents were closed either by primary suture, if possible, or by the application of living fascial grafts in order to stop the cerebrospinal fluid leak. While wide laminectomy was believed to be the proper operation in the closed injury, it was generally felt that in the fresh open wound only the bone that was actually damaged or in danger of not remaining viable should be removed. The excellent healing and frequent return of function, particularly in the incomplete lesions, which resulted from such treatment of the spinal cord injuries of World War II have given new hope and eagerness to the younger neurological surgeons. As Tinsley has pointed out, such early acquaintance with the actual situation in the cord, be it found to be completely severed (a not very common occurrence) or injured to a lesser degree, leads to more intelligent later care and permits a more accurate statement of the eventual prognosis. All open wounds, it is agreed, should be treated with the adjunct of chemotherapy, but with no direct application of any sulfonamide to the exposed cord.

Certain aspects of the technique of surgical procedure are agreed upon by most neurosurgeons. All agree that insofar as possible only local anesthesia should be used for the operation of laminectomy. As Stookey has pointed out, it is unwise to open the dura out of curiosity over a freshly swollen cord if no bone fragments or foreign bodies are to be removed, for the softened cord will only tend to herniate through the dural slit and thus sustain further damage. The occasional article by orthopedic surgeons suggests the attempt at manual reduction of the fracture by means of prying the vertebrae back into position when the laminectomy has been accomplished; others suggest, further, that at this operation the spine be fused. Both such procedures are nailed by the neurosurgeons as dangerous and unwarranted. Clark, who advocated manual reduction of the cervical fracture-dislocation at the scene of injury before x-ray studies had been made, also advocated that when laminectomy was performed and the block was found to be due not to bone compression but rather to edema under the cord, a longitudinal slit should be made in the dura to relieve such edema pressure. Palmer stated that laminectomy is attended by a high mortality, but this is certainly not the experience of either the neurosurgeons or orthopedic surgeons who perform the operation only when the patient is in proper condition or after the proper period of time in the case of cervical injury. It is the unanimous opinion of all surgeons with experience in the late war that the patient with a spinal cord injury suffers more in the theater of war from the ill effects of transportation than from the shortage of hospital refinements, that speed and priority of evacuation should be given these patients, and that in the case of the open wound, primary healing of the wound itself and stoppage of the cerebrospinal fluid fistula is of first importance.

Concerning the indications for late operation, Wortis and Sharp summarized the opinions of most authors. "Cases of intractable root pain secondary to fracture of the spine or of a lamina will occasionally require the attention of the surgeon. In a few instances there may be an indication for late operative intervention in the following conditions: (a) Callous encroachment in the spinal canal giving slowly increasing neurologic signs. (b) Callous encroachment on the spinal roots giving intractable pain not helped by injection of the roots. Such patients may require rhizotomy or cordotomy. (c) Herniation of the intervertebral disc giving back pain, associated neurologic signs and roentgen or myelographic evidence of herniation of the disc. (d) Hypertrophy of the ligamentum flavum with increasing pressure on the spinal cord. (e) Post-traumatic adhesive arachnoiditis." It is the repeatedly expressed opinion of many authors that decompressive laminectomy in a case of long standing complete neurological loss below the injury is a futile gesture, even though there is a complete block of the cerebrospinal fluid and demonstrable bony compression. However, the occasional surgeon (Rand), does sometimes operate on such patients for whatever beneficial psychological effect it may have, and in order to clinch with both the patient and his relatives a statement of the undeniable prognosis. But even those authors who discourage laminectomy at any time for a com-

plete transverse lesion of the cord advocate operation, either early or late, for the injured cauda equina, since there the problem is a different one, dealing as it does with the more favorable possibilities of the peripheral nerves. Knight, however, has made the following unusual statement: "It is, of course, unnecessary to remark that even in the case of the cauda equina, which it is sometimes suggested should be sutured, suture of divided nervous tissue is futile and should not be considered. Even in the cauda the absence of a neurilemma precludes regeneration."

LATE CARE; NURSING PROBLEMS

Rehabilitation. The time arrives in a few weeks after injury when all active treatment for the injury itself becomes less hopeful. The bone has healed in most patients, and the major problem no longer is one of neurological recovery. The patient must be prepared for an existence as a bed patient (fortunately only a few are in this category), as a wheelchair patient, or as a semiambulant patient with the need for crutches, walkers, or braces. World War II has given a tremendous impetus to the re-education of the paraplegic patient, and literature on the present day programs of rehabilitation used principally in the "paraplegic centers" of several Veterans' Hospitals is only recently beginning to appear. These programs are being carried out on a lavish scale, but are no more, actually, than those which have long been advocated by such authorities as Davis (21, 22), Elsberg, Coleman and Pilcher (78), Stookey, and others (113). Carefully supervised recreation, physical therapy, and occupational therapy, and study in trade schools are all a part of the general program to improve the morale of the patient, to re-adapt him to a happy and, if possible, useful existence, and to give him the maximum chance for physical recovery. Therapeutic exercises, and specially made and individually fitted braces are at this time being developed into something of an art, and the great force promoting such a program is, happily, the United States Government, as reflected through the care given the paraplegic patients in Army, Navy, and Veterans' Administration hospitals. It has even been proposed (113) that those paraplegics not wishing to return to their homes, or not being able to do so for one reason or another, be grouped into "communities" where they will all look upon themselves as equals, where they will be less the object of pity and curiosity than they are in public institutions, and where they can work toward a semblance of normal existence.

General nursing problems. The paraplegic patients present many special difficulties of nursing care, and it may well be said that after the first few weeks they constitute for the most part problems only for the nursing staff, and not for the surgeon, although at all times every phase of the convalescent and chronic care should be under the supervision of a competent, interested physician. The government has found that in most instances the primary responsibility of the care should be that of the medical neurologist, with the aid of the neurosurgeon and of the orthopedic, urologic, general, and plastic surgeons, as well as of the internist who can consult in problems of general medical care and nutrition. When thus handled, this class of patients has apparently required no more special psychiatric care than has any other type of chronic patient. It has been repeatedly pointed out (21, 22, 26, 78, 84, 113) that the main difficulties of nursing care, other than those of rehabilitation and education, have to do with nutrition of the patient, bed sores, and the various complications of the paralyzed bladder. All these and other complications are discussed later in this review. Fay and Munro (69) have insisted, along with others, upon the persistent attitude of optimism on the part of all ward personnel who nurse patients with injured cords. "A defeatist attitude on the part of everybody concerned must be avoided at all costs." A hopeful, friendly, interested approach by the nurse, whom the patient sees more than any one other person, is a great factor for good in the comeback of these unfortunate persons.

THE TREATMENT OF COMPLICATIONS

Nutrition. Harper (113) has pointed out the necessity of careful supervision by a trained dietitian of the diets of paraplegic patients. He urged a high protein intake, and an average caloric supply of about 2,800 calories daily. It is not desirable for the patient to gain weight particularly, although in many instances it is desirable to a certain degree since the well fat-padded weight-bearing points are less likely to develop decubitus ulcers. If such ulcers exist, there is a serious loss of plasma proteins in the exudate, and this must be made up by a proper protein intake in the diet. A high vitamin diet is desirable, and for the purposes of improving the bladder status a generous fluid intake is also urged by most dietitians.

Decubitus ulcers. There is not an author but who insists upon every nursing measure possible to *avoid*, rather than *heal* (if possible!) the bugbear of decubitus ulcer. There is no place where the ounce of prevention is worth so much more than the pound of cure. It is the unanimous opinion of all writers quoted that to prevent these sores

weight-bearing points must be rested frequently by turning the patient, and by massaging and drying the skin. Sheets must be clean and smooth. The skin must be bathed frequently and kept dry and free from feces, urine, and perspiration. Some surgeons apparently insist that the bedridden patient be turned every hour, others every 2 hours, with care each time to the surface that bore the weight. This, as in all the other care of the patient, assumes a well trained, well supervised, and willing nursing staff. Attention to the avoidance of decubitus ulcers must begin within the hour after injury, and can never, for the rest of the patient's existence, be relaxed at any time. Many of the recent articles, stemming from war experience, indicate the fact that delayed and inadequate nursing care during the first few days after injury, in the theater of operations, was the main source of bed sores, and it is for this reason, among others, that military surgeons have insisted (not always successfully) upon evacuation priority for these patients. It is almost the unanimous opinion of the neurosurgeons that plaster should never be used when it can be avoided, since beneath it sores can and do develop. Others just as strongly advocate its routine use. Apparently some surgeons still think bed sores are an act of God and entirely unavoidable. One author (7) stated that a method of avoiding bed sores was to put the patient in anterior and posterior body shells, from knees to shoulders, and turn the patient "2 or 3 times a day."

Once a decubitus ulcer has developed, the general care of the patient becomes increasingly difficult. Munro (68) pointed out that the normal vasomotor reflexes of the skin are altered below the level of a spinal cord lesion, on account of a change in the sympathetics, and because of this fact, mild pressure, which would be tolerated by normal skin, quickly causes necrosis as a result of anoxia and anemia due to pressure. The fact that the skin is anesthetic is not the basis for the development of these ulcers. Munro cast out the term "trophic" in the description of these ulcers, pointing out that the same effect is frequently seen in the cachetic but normally sensitive patient who has had the same inattention to the skin. He strongly advised against the use of the Bradford frame, plaster-of-Paris jackets, sawdust beds, rubber or other rings and "doughnuts," lambs' wool pads, and other such devices. He recognized the sole importance of cleanly care to the skin and the frequent change of position for the patient, all of which are matters under the control of a willing nursing staff. It is his opinion that no mechanical tricks equal personal nursing attention, and that, of course, is the opinion of all well informed authors who have had extensive experience with the care of decubitus ulcers. Some authors suggest débridement of the ulcer as sloughs appear, with simple dressings to the open wound. Munro advised against all incision and drainage of the ulcers, against débridement, and against moist dressings in any form. He, with most others, finds such lesions highly contaminated, but has found sulfa powder dressings useful, as well as painting with tincture of benzoin once daily when the ulcer is not a frank, open, exuding mass. Munro, along with others (21, 22, 78) has advised the use of sponge rubber, air, or water mattresses, and the use of radiant heat and ultraviolet irradiation which has been found to be useful to promote healing.

The plastic repair of decubitus ulcers, once they are relatively free of infection, is successful in a great many cases. As Barker (113) pointed out, in some instances they can be closed by simple excision and primary closure. Some, such as those on the buttocks, will require the use of rotation flaps. Others can be closed by free grafts, although the latter method is sometimes less successful. In the well nourished patient, even extensive sores, if well tended, may eventually show granulation and epithelize.

"Mass reflexes"; spasm; contractures. Scarff and Pool have recently proposed the interesting theory that the so-called mass reflexes and severe muscle spasm which are the lot of many paraplegic patients are influenced by scar at the site of the lesion on the end of the distal cord segment. They believe that this cicatrix heightens the irritability of the isolated segment of cord, and that removal of the cicatrix, excision of all local degenerated tissue, and surgical section of the dorsal columns in the upper portion of the lower cord segment helps to allay or completely remove this condition. Braden (113) found reason to believe that curare offers some limited improvement in this condition, although its effects are transient and not without undesirable side effects. Elkins and Maltby (113), as well as Munro (72) and others have advocated anterior rhizotomy for the relief of severe spasm, and Munro has given detailed instruction for the technicalities of the procedure. Mayfield (113) recognized the value of the procedure, but advised that it be put off for at least a year after injury or until it was certain that no further neurological recovery would be observed, since the operation is a permanently destructive one. Davis (21, 22) has found obturator nerve section within the pelvis of distinct aid in overcoming the handicap of strong adductor contraction. It has the

advantage of not affecting the leg muscles most used in locomotion and is therefore less destructive in its effects. Along with others, Munro has demonstrated that the relief from spasm means that the patient can be made ambulant with the use of braces and crutches, that he is more able to be up in a wheel chair, that the development of bed sores is less a threat and nursing care is easier, and that, above all, the patient's morale is improved. Tenotomy may be performed for the permanently contracted shortened muscles when all hope of recovery has been abandoned (87).

Pain. Mitchel (113) pointed out that inadequate early operation on the injured cauda equina or the presence of root pain with such injury were indications for secondary surgery, and that the removal of depressed bone fragments or foreign bodies, with some attempt at restitution of the nerves, would offer relief from the pain which is a common sequel to caudal injury. Others have pointed out that the root pains associated with cervical fracture-dislocation are frequently stopped when adequate realignment of the vertebrae is obtained. Intractable root pain in injuries of either the cervical or thoracic cord can be stopped by adequate posterior rhizotomy. Elkins (113) also pointed out that bony overgrowth, the presence of a foreign body, post-traumatic arachnoiditis, and the spasm itself may be the source of such severe pain that surgical relief is necessary. When the cause can be removed, this should be done; when it cannot, posterior rhizotomy, or cordotomy (also 78) on the spinothalamic tracts, should be performed. Care must be taken that additional injury to the motor tracts or an increase in the spasm is not produced by technically inadequate cordotomy. The role of the sympathetics is not understood by most surgeons, and many patients with apparently complete lesions complain of unremitting burning pain which is not controlled by such questionable methods as novocainization of the sympathetics. It has been found, too, that many times such vague and patternless "pain" has a strong functional element, and can be overcome by re-directing the attentions and interests of the patient. All are agreed that these patients should not be made drug addicts.

The bladder. The care of the bladder paralyzed by a spinal cord injury is a subject for great controversy between urologists, urologists and neurosurgeons, and between neurosurgeons. A review of the literature makes apparent the fact that most urologists consider the care of the bladder under such circumstances as a purely urological problem, some urologists and neurosurgeons consider it a joint problem, and some neurosurgeons believe that it is a neurological problem and they therefore do not seek urological consultation. All authors agree, however, that the care of the bladder is a major problem, that it is a complication of the injury from the moment of the trauma, and that much of the success or failure of later bladder function depends upon the proper initial care.

It has been pointed out (63, 64, 115) that the appalling death rate among British casualties in World War I suffering spinal cord injuries was due to urinary sepsis, and it is the belief of many British authors that this now somewhat embarrassing fact was due to early repeated manual catheterization. If one is to judge by articles dealing with the care of the bladder in the casualties of World War II, it would seem that the method of choice was early suprapubic drainage with a large tube and the fistula placed well above the symphysis pubis; later, when the patient reached adequate hospital facilities, the tube was removed and replaced with a permanent indwelling catheter. It has often been said that the suprapubic tube is placed "for purposes of transportation," but it has been the experience of more than one surgeon to receive the patient at the base hospital with urine oozing out around a plugged-up suprapubic tube (which promoted the formation of bedsores), with a necrotic fistula, or, on occasion, with the long unattended tube simply rotted off and lying free in a mass of calculus in the bladder. Certain authors (2, 51, 116), particularly among the British, dislike all apparatus which must be fixed to the penis. They describe a "trocar" method of performing the suprapubic cystostomy with insertion of the tube immediately above the symphysis, a method most unpopular in America. Tidal drainage, generally popular in America, has been found by many to be unreliable, dangerous when it does not work properly, and requiring too much close attention (2, 8, 114). In fact, Taylor believed he could trace 2 deaths directly to the use of the tidal drainage apparatus, whereas Munro, America's first proponent of the method, quoted figures showing a sharp decrease in morbidity and mortality through the use of this method. Browder and Grimes (8) are among the few neurosurgeons who advocated the use of manual expression, a method long in favor among British urologists and some British neurosurgeons. They (8) stated: "In an effort to eliminate the use of the indwelling catheter, we have extensively employed manual expression of the urine by suprapubic pressure. Furthermore, the use of this procedure facilitates the establishment of automatic urination." Detailed instructions are given for the employment of this method, and they go

on to say, "Although the bladder cannot be completely emptied by this method, infection is extremely rare. . . . The intelligent co-operation of the staff (nursing) is a prerequisite if successful results are to be expected. An obese abdomen precludes the possibility of manual expression of the urine by suprapubic pressure. Elderly patients who may have thin vesicular musculature, possible diverticuli of the bladder, or urethral obstruction from hypertrophy of the prostate should never be treated for urinary retention of traumatic origin by this method." Oldberg has rarely seen the development of a true automatic bladder.

Munro (65–73), Scarff (102), and others have described in detail the construction, uses, and applications of the tidal drainage apparatus. They do not indicate that it is a simple, self-regulating mechanism, but they recognize in it a means of continuous cystometric study, and a means of keeping at a minimum the bladder infection which is bound to occur, medication notwithstanding, when any foreign body such as a catheter is placed in the bladder, and they believe that some such continuous method of drainage is essential. They point out, too, that it is the only certain and safe means of "training" the bladder into automatic function, provided the injury is one of the cord and not of the cauda equina.

The various methods of treating the bladder are, in summary, noninterference and letting the bladder distend until it overflows (if it will *before rupture!* as some authors have cynically pointed out); aspiration of the bladder with a large needle directly through the abdominal wall until some better method can be employed; manual expression; repeated intermittent catheterization; use of the simple indwelling catheter which is allowed to drain freely; use of the indwelling catheter which is opened for drainage every 4 hours, following which the bladder is allowed to collect a certain amount of urine by the closing of the stop cock; suprapubic cystostomy; perineal cystostomy with an indwelling mushroom catheter; and use of the indwelling catheter with tidal drainage. The literature shown in the references to this review is replete with strong arguments for these various methods or against them, and the authors' views are illuminating reading.

Hinman, one of America's senior urologists, in a concise and instructive article has stated the problem very well. "The usual course of the effect on micturition of a transverse lesion of the cord at any level is first, retention, second, overflow incontinence, and third, automaticity. . . . Automaticity never develops with destruction of sacral segments or cauda equina." He stated that actually there was reason to choose variously between the many methods of treatment, since all had their virtues and the particular case might demand one or the other procedure. He felt that the dissenting authorities were as reliable as those arguing for the use of noncatheterization and manual expression, suprapubic cystostomy, or retention catheter with or without tidal drainage. He only stated categorically that no paralyzed bladder should be let alone to distend and overflow, and the urethral catheter should never be used casually or intermittently. Other than for the primary purpose of allowing the escape of urine, bladder care need be concerned only with the prevention of sepsis and wetting of the patient with the resultant bed sores. The paralyzed bladder, he believed, is strictly a urologic problem.

Hinman feels that manual expression is the one method of avoiding infection, but that its use requires a skill and regular attention not frequently found in nursing staffs. If infection does exist, the use of manual expression may cause an ascending pyelonephritis. Furthermore, the bladder may be ruptured. It is best never to resort to manual expression if the patient has at any time been catheterized. All in all, he feels that the suprapubic tube is the method of choice, and this is a common expression among urologists. Petroff (113) and others have agreed with most neurosurgeons that the suprapubic tube does not necessarily guarantee the least urinary infection for the patient, and that it is not the driest method by any means. He, with many others, has found that the early change from a suprapubic tube to an indwelling catheter was a great boost to the patient's morale, for he found that the suprapubic tube was repugnant to most patients. He advised the usual current method of placing a Foley catheter, small enough to allow the escape either into the bladder or externally of the urethral secretions, frequent cystometry, and daily irrigation with "M" solution or some other suitable bladder antiseptic. It is frequently pointed out that acid urine is the less septic, and the fluid intake of the patient should be at least 3,000 c.c. daily.

Emmett (29, 30) has recently advocated transurethral resection of the vesical neck in the management of "cord bladders," and actually this procedure has been in effect for some time in the hospitals of the Army, Navy, and Veterans' Administration. In discussing the reasons why there is always residual urine in the "cord bladder," he stated: "Modern urologic thought has suggested a more attractive and rational explanation. Inasmuch as it has been shown that no true internal vesical sphincter exists, it is assumed that the

vesical neck is simply the edge of the detrusor muscle, and, therefore, takes part in the spasticity, hypertonicity, and hyperplasia of the detrusor muscle as a result of transverse lesions of the cord. It is reasonable to assume that this muscle may act as an obstruction at the vesical neck, and may be a considerable factor in the inability of the bladder completely to empty its contents. As time passes this condition may be aggravated by infection and subsequent fibrosis of the vesical neck. Such an explanation sounds logical. If it be correct, then transurethral resection of the vesical neck should offer a good chance of cure."

Petroff (113) has discussed the use of penicillin, the sulfonamides, and other new antibiotics in the control of urinary sepsis. Joelson and Hamm (113) have summarized well the problems concerned with the prevention and treatment of urinary calculi.

SUMMARY

The paraplegic patient with his problems has been brought into the consciousness of the lay and medical public with a tremendous impact by the large number of such casualties incurred in the recent war. One has only to read of the medical experiences in the care of these patients after World War I, and then the recent reports of the accomplishments under modern conditions to realize how much has been accomplished in the interval in the cure and rehabilitation of these patients. One also finds, as already indicated, that a wide divergence of opinion still exists, centered mainly about 2 problems: (1) When is the patient to be operated upon for decompression of the cord? and (2) What is the proper care of the paralyzed bladder? One finds the attitudes range from the eager, humanistic hopefulness of men like Temple Fay and many other, younger surgeons with the experience of World War II, through the conservatism and latitude of opinion of such authorities as Coleman, Pilcher and Meredith (13, 78), Davidoff (20), Davis (21, 22), Oldberg (80), and others, to the stark realism, even pessimism, of equally reliable surgeons as Elsberg (27) and Naffziger (74). It is generally agreed that the care of the paraplegic patient is in the main a nursing problem, but a nursing problem which in its many ramifications takes the constant supervision of a well trained, interested, energetic, and open-minded doctor. It is a nursing care crammed with meticulous detail, all of which must be religiously followed.

As already indicated, in the literature there lurks many a statement which is patently false or even ridiculous and which should be pointed out to the unwary. To understand the care of the patient with an injured spinal cord, a fundamental knowledge of neurology is an absolute essential. It is not a mechanical problem. It is not a problem to be covered by "standing orders" or an attitude of "let the nurses do it." The paraplegic patients are here, and the problems of their care and treatment must be thoughtfully carried to their solution. There is no doubt but that these patients have been played up too strongly in the public mind. They have become the center of much interest, not medical, which may eventually make their management even more difficult. The very word "paraplegic" is objectionable. It is frequently heard nowadays from the lips of patients and lay persons, singling out, stamping, and labeling these patients as doomed with a special and hopeless disability. Therefore, a less pointed, less specific term should be adopted. These patients are seriously, tragically injured persons, and should be treated as such, but they should not be singled out from those with other types of injury for overindulgent publicity. They are before us as a medical problem to be continuously wrestled with. To quote Pilcher:

"Like Humpty-Dumpty, the spinal cord can never be put together again! At first glance this gives the subject a hopeless case and suggests that this paper might better be left unread. However, such a defeatist attitude would neglect the possibilities of prevention of further associated bony injuries, of palliative therapeutic methods, of avoidance of complications, and of adequate diagnosis with its resultant correct choice of therapy and accuracy of prognosis. In no field of surgery are the results perfect. Only by continuous study of our unsolved and seemingly impossible problems may further progress be made. To the neurosurgeon, this is not a strange difficulty."

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Marino, H., and Craviotto, M.: Fracture of the Mandible (Fractura de la mandíbula). *Prensa méd. argent.*, 1946, 33: 1823.

In common fractures of the mandible situated in the horizontal rami, it is enough to fix both dental arches with ligatures to obtain excellent results, but when dental fragments are absent and the fracture is situated behind the angle of the mandible, the integrity of the maxillary arch which serves as the immobilizer is lost and difficulties arise. Intraoral appliances always fail because it is impossible to obtain good control of the ascending ramus which is pulled upward by the violent force of the pterygoid muscle.

Rainsford Mowlem, the English plastic surgeon, used the method of Roger Anderson, i.e., reducing and fixing the bone fragments with pins or screws.

This method of treatment is indicated in the following conditions: fractures in the toothless with great displacement; fractures behind the dental arch, and fractures complicated by injuries of the face with lesion of the superior maxillary arch impeding intraoral prosthesis; fractures without fissures which cannot be fixed by dental arches; comminuted fractures with destruction of the osseous segment; greatly displaced fractures, and those in which intraoral treatment is no longer possible; fractures in patients to be transported by sea or air, and in those with vomiting; fractures with great trauma of the face, accompanied by loss of substance, and in which grafting is required; and exposed comminuted fractures subject to early removal of bone splinters.

Contraindications to this method are: suppurative processes near or in the line of fracture, or zone of insertion of the pins; fractures of the neck or the coronoids; and sometimes the character of the bone.

The advantages are: permanent and effective immobilization; conservation of the masticatory function and acceleration of consolidation; avoidance of articular rigidity; facilitation of buccal cleanliness and feeding. Gingivitis and irritation by intraoral methods are avoided; the patient is comfortable and without pain; and the appliance is easily covered by a handkerchief or muffler.

The apparatus consists of 2 or 3 metallic walnuts formed by a central screw, and two canalized hemispheres with a middle piece; intermediate bars of union; unoxidized steel wire pins; and a wrench to tighten the screws.

The authors first secure a good roentgenogram showing the arrangement and relations of the neighboring dental fragments. Complete muscular relaxation is desirable; it may be obtained by means of intratracheal anesthesia or, as preferred by the authors, by local novocaine infiltration. The index finger is introduced into the mouth, while the fingers of the other hand delineate the fracture externally, and the assistant marks the posterior and inferior borders of the mandible with methylene blue or brilliant green. It is advantageous to insert the pins close to the line of fracture (about 1 cm.), but it is not always possible. They must be inserted at least 0.5 cm. from the inferior or posterior border so as to avoid the dental foramen with its nerves and vessels. To introduce the pin a mechanical or electric drill is used or the skin is perforated with a sharp pointed scalpel, and the pin hammered into the cortex. Counterpressure is provided by the intraoral finger. Drilling should be done slowly to avoid heat necrosis around the pins. A metallic plate, to limit the depth of penetration, may or may not be used. For better control of the fragments, the two pins should have a distance of 1 cm. between them. On the pair of pins corresponding to each fragment, the squared half-walnut is secured and the two pairs are fixed firmly with an intermediate bar which is fastened to the other canalized half walnut. It is not always possible to retain the ideal reduction, so it is wise to add an intermediate walnut formed by two canalized half walnuts and to use two smaller bars to obtain an adaptable universal joint. The simple external dressing is a small roll of gauze twisted at the level of the point of entry to the skin. Some surgeons apply a temporary interdental ligature or a sling bandage, which is not necessary in the majority of cases. Consolidation is verified clinically and roentgenographically, the walnuts are loosened, and, without anesthesia, the pins are extracted with pliers. The residual scar is minimal.

The authors cite the case of a patient with fracture at the inferior maxillary angle. His upper maxilla was entirely toothless; there were some teeth in the anterior portion of the lower jaw and a right molar was present. On the left side where the trauma occurred there was a second molar and the root of the third molar passed through the line of fracture. The lesion had been suppurating for 12 days when the patient was first seen, and there was a fistula in the region distal to the second molar. The pus was evacuated externally, and the jaw was immobilized; penicillin was given. The pins were removed after 32 days; the result was good. A. B. VICENCIO, M.D.

Stewart, M. B., and Conley, J. J.: Fractures of the Malar-Zygomatic Compound: Treatment by Improved Methods and Myoplasty. *Arch. Otolar.*, Chic., 1946, 44: 443.

The authors review the history of fractures of the malar-zygomatic compound, and discuss some of the

more popular methods of treatment in use at the present time.

The symptoms and signs of a fracture of the malar-zygomatic compound are (1) pain; (2) periorbital swelling and depression or flatness of the face; (3) pain on mastication; (4) trismus, if the arch is involved; (5) intranasal hemorrhage on the injured side; (6) diplopia; (7) emphysema; (8) a palpable depression extending into the orbit; (9) subconjunctival hemorrhage; and (10) neurological changes resulting from damage to the infraorbital nerve.

The four principal sites of fracture correspond to the articulations; that is, (1) at the superior external orbital margin, (2) the region of the infraorbital foramen, (3) the zygomatic arch, and (4) the zygomatic process of the maxilla.

The authors mention the principal methods of treatment of simple depressed fractures of the zygomatic arch, the first method being that of Matas, in which a silver wire, passed under the zygomatic arch and twisted over an external padded splint, is used to hold the fragment elevated and in position.

Keen's intraoral approach through the buccal fold over the upper second molar is described briefly. This consists of elevating the fractured arch and maintaining this reduction by means of a lubricated pack.

The method of Manwaring and Gill consists of elevating the fragments by grasping the zygomatic fragment with a medium sized towel clip and manipulating it into position.

The Gillies method, or temporal approach, is the method of choice. It consists of making a horizontal incision over the temporal muscle and passing an elevator beneath the temporal fascia under the zygomatic bone. The skull is padded and used as a fulcrum and the fragments are manipulated into position. Approximately 95 per cent of the fractures of the arch can be reduced by this method.

In the treatment of malar fractures, manipulation is more difficult, and fixation and traction are frequently required. The fragments are often impacted and reduction cannot be delayed as long as with a fracture of the zygomatic arch.

Roberts makes an incision over the malar eminence and elevates and manipulates the malar bone by using a corkscrew-like instrument.

Fixation of the malar bone can be accomplished occasionally by direct wiring with tantalum wire. When traction with external fixation is needed, a plaster of Paris head cap is constructed, and a screw eye is inserted through an external stab incision into the malar fragment and held in position for about a week.

Lothrop's method consists of the antral approach with elevation of the malar bone and packing of the antral cavity.

Associated fractures of the maxilla can be reduced without a cumbersome head cap by internal fixation with wire, this being placed through the orbital rim and through the soft tissues, to be fastened to the teeth. These wires are left for several weeks and are then removed by opening the original incision, cutting the wires, and pulling them out through the mouth.

The author enumerates the more common complications of fractures of the malar-zygomatic compound. These are: diplopia, nerve injuries, hematoma in the maxillary sinus, and contracture of the masseter muscle. A special method of correction of the last named complication is described. This consists of a myoplasty in which three through-and-through transverse incisions are made in the masseter muscle at the zygomatic end, one of them being in the anterior third and one in the posterior third of the muscle at the point of attachment to the zygoma. The third incision is made through the middle third of the muscle at some distance below the first two. This allows for greater opening of the mouth.

LOUIS T. BYARS, M.D.

EYE

Duggan, W. F.: Vascular Basis of Allergy of the Eye and Its Adnexa. *Arch. Ophth.*, Chic., 1946, 36: 551.

The author has reviewed the literature of allergy from the viewpoint of the etiological importance of histamine or histaminelike substance. His concept of allergy is that some influence, either chemical, nervous, humoral or climatic, through histamine, a histaminelike substance, epinephrine, nicotine, or overaction of the sympathetic nervous system causes a smooth muscle spasm, capillary dilatation, or both. The arteriolar constriction and the capillary dilatation cause a slowing of the blood stream in the capillary bed with a resultant capillary and tissue anoxia. The capillaries next become more permeable as a result of either lack of oxygen or of opening up of the spaces in the capillary walls and allow the passage of plasma, fibrin, white cells, and red cells through their walls.

Since it has been shown that nitrites are beneficial in the treatment of anaphylactic shock and that there is a capillary and tissue anoxia, and since the author concluded that oxygen is a physiological antidote for histamine, he reasons that drugs which increase the oxygen to those tissues should be of value therapeutically. He therefore used vasodilators in the form of sodium nitrite, amyl nitrite, erythritol tetranitrate, and acetylcholine bromide in the treatment of conditions thought to be on this basis. The rationale was that it would reduce not only the offending agent, but also the resultant deficiency in oxygen. Foreign protein therapy was thought to be too dangerous and too likely to cause further allergic reactions.

Various eye diseases were then considered as being of possible allergic etiology. It is believed that acute glaucoma is a manifestation of capillary and tissue anoxia, and has the same pathological picture as that of histamine and allergy; and that if acute glaucoma is an angioneurotic edema of the eye, it is due to histamine formed elsewhere and transmitted to the ciliary body where it acts on the capillaries and possibly the arterioles. In the

author's opinion, the relief of anoxia by amyl nitrite accounts for some good results in the treatment of acute inflammatory glaucoma.

Herpes corneae, herpes zoster, and herpes irides are suggested as being allergic lesions on the basis of the typical pathology of allergy in the gasserian ganglion. This could be caused by histamine, and treatment with vasodilators gave good results.

Various types of paralyses of ocular muscles may be due to allergy with consequent angiospasm, and capillary and tissue anoxia. It is believed that closure of one of the retinal arterioles with its resultant changes represents an allergic reaction in its simplest form. The possibility of an allergic basis in some cases of retinal detachment is considered.

The pathology of multiple sclerosis is compared with the pathology of allergy and found to be identical. It is thought that the local circulatory failure causes the myelin breakdown and that the glial overgrowth is secondary, not primary. The pathology of retrobulbar neuritis was that of multiple sclerosis.

The causes of iritis and iridocyclitis are listed and it is noted that all had vascular dysfunction in common, thought to be allergic in nature. Acute exudative choroiditis and choroidosis serosa centralis are classed in this group. The pathological picture of scleritis and episcleritis was also suggestive of allergy.

The author has had excellent results in the treatment of these cases with vasodilators and he believes that although the treatment is nonspecific as regards the cause, it is specific as regards the pathophysiological basis of the lesion.

ROGER H. JOHNSON, M.D.

Foster, J.: Certain Operations on the Superior Oblique Muscle. *Brit. J. Ophth.*, 1946, 30: 676.

In the past Von Graefe had considered it better judgment not to operate on the oblique muscles. Since then, myectomy, tenotomy, recession, and resection of the inferior oblique muscles have all been frequently performed with success, although there has been relatively little surgery of the superior oblique muscle. Because of this relative rarity, the author has reported 3 cases of surgery of the superior oblique tendon.

The first case was that of a man who had been hit in the forehead well above the orbital margin. Following this blow there was a paresis of the left superior oblique muscle resulting in a vertical diplopia in the whole lower field. Vertical prisms were of some benefit and orthoptic exercises were given. Later, a partial tenotomy of the right inferior rectus muscle was done, but the patient continued to have hyperphoria and cyclophoria. Because of this, the inferior oblique muscle was tenotomized by the Dunnington method. The superior rectus was divided to expose the superior oblique. A double armed catgut suture was inserted through the superior oblique tendon about 6 mm. from the insertion. This point was attached to the episcleral tissue of the globe in the line of the muscle without dividing the insertion. This, then, was more of a tuck than a real advancement. The results were most successful clinically, but there was a slight postoperative weakness of the left superior rectus muscle and residual overaction of the right inferior rectus and inferior oblique muscles.

In the second case the patient had had a basal skull fracture with a resultant paralysis of the left fourth and sixth nerves. Surgery which included a 6 mm. recession of the internal rectus, transplantation of the lateral half of the superior and inferior recti to the insertion of the external rectus, and a 6 mm. tuck of the superior oblique tendon to its insertion was performed on the left eye. The results were satisfactory except for a restriction of the internal rectus muscle.

The third case had a marked limitation of the inferior rectus muscle of the left eye as a result of a penetrating injury in the orbit. Surgery of the inferior rectus was not satisfactory because of marked fibrosis and adhesions. An 8 mm. recession of the right superior oblique muscle was done with fairly satisfactory results. ROGER H. JOHNSON, M.D.

McLaughlin, R. S.: Chemical Burns of the Human Cornea. *Am. J. Ophth.*, 1946, 29: 1355.

A chemical burn of the cornea was defined as an injury which results from local contact with a chemical to such a degree that there is alteration in the structure of the cornea and conjunctiva as demonstrated by a positive stain with 2 per cent fluorescein. The author reported on a series of 500 consecutive cases of this type. He found that 52 per cent of the injuries were caused by vapors and mists, 31 per cent by liquids, and 17 per cent by solids.

Because immediate care is of first importance, a system of first aid was carried out in the industrial plants. The workers were instructed to wash their eyes thoroughly at one of the handy eye-washing fountains. They were then taken to the dispensary where the type and *p*H of the offending agent were recorded. The eye was anesthetized, gross particles were removed, and the eye was irrigated with a continuous flow of normal saline solution for 15 minutes. Fluorescein was instilled and, if the eye stained, it was again washed for 15 minutes. If the eye stained again, the patient was referred to the ophthalmologist.

The treatment by the ophthalmologist consisted of further irrigation, débridement, the instillation of pontocaine and sulfathiazole (or sulfadiazine) ointments, and patching. However, it was found that certain chemicals, namely, all alkaline and a few neutral organic compounds had a "delayed action." These compounds frequently caused opacification of the cornea and adhesions of the conjunctiva following a symptom free period of several hours after contact. These same chemicals were found to form grayish well defined areas in the superficial layers of the corneal epithelium. It was thought that the foreign compound was first physically absorbed by the protein structures of the cornea. Then a portion of the absorbed chemical denatured the cellular pro-

tein which resulted in a liberation of the remaining unaltered chemical, and this in turn caused more damage both to the epithelium and Bowman's membrane.

Since in animal experimentation attempted neutralization caused no amelioration of the injury, the cornea and conjunctiva were completely denuded of epithelium in the staining areas. This was done thoroughly with a cotton swab under cocaine anesthesia after which the eye was flushed with stainless merthiolate. By this method it was hoped that all the offending agent was removed. After acid and most neutral chemical burns, the eye was just débrided and irrigated. Then all types were treated with pontocaine and sulfathiazole (or sulfadiazine) ointment and patching. Homatropine was reserved for those who were not doing well on the second day. The instillation of methylene-blue powder and atropine, the use of foreign protein and sodium salicylate, and a search for foci of infection were begun if healing was not complete on the third day. The author believed that more vision was lost in chemical burns because of foci of infection than because of the actual effect of the offending agent.

Of these 500 cases, 91.2 per cent healed in 48 hours, 7.4 per cent healed slowly, and 1.4 per cent healed with a residual loss of vision. The last 7 cases were reported. ROGER H. JOHNSON, M.D.

Carpenter, C. P., and Smyth, H. F., Jr.: Chemical Burns of the Rabbit Cornea. *Am. J. Ophth.*, 1946, 29: 1363.

This study was undertaken to help in estimating the damage to an eye by various chemicals and in the hope of instituting more rational therapy.

The authors first graded the severity of the eye burns resulting from a large number of chemicals and mixtures instilled in rabbits' eyes. This grading was based on the appearance of the cornea and iris before staining and on the area of the cornea that stained. The grading was felt to be reliable because the higher the score the longer the eye took to heal, and because the higher the concentration of the chemical used the higher was the score.

To test the various chemicals and their dilutions a measured amount of fluid was instilled in a proved normal eye of an albino rabbit. The eye was examined from 18 to 24 hours later and the injury was scored. A total of 180 chemicals were arranged according to the grade of injury and listed in a table.

Since it has been thought that neutralization of acid or alkali burns is good treatment, the authors burned rabbits' eyes with acetic anhydride and then treated them with milk of magnesia. They found that milk of magnesia was of no benefit and did harm in some cases. They then burned rabbits' eyes with sodium hydroxide and irrigated them with 2 per cent acetic acid or 0.85 per cent saline solution. There was considerably less damage to the eye that was irrigated with saline solution alone. It was then found that citric acid in 2 per cent and in 0.5 per cent solutions damaged normal rabbit eyes.

The authors divided chemical burns of the eye into three catagories; namely, those produced by neutral, acid, and alkaline agents. In this article they investigated alkaline burns of the cornea. It was found that alkaline (and some neutral) agents caused a delayed damage to the eye even after prolonged irrigation. The authors were able to show that a rabbit's cornea retained a higher *p*H following a sodium hydroxide burn even after prolonged irrigation. This was demonstrated with a sealed hanging-drop preparation of corneal tissue and with a glass electrode. An in vivo test was devised in which the cornea of one rabbit was burned with sodium hydroxide and then well irrigated. A superficial section of this cornea was removed and placed on the eye of another rabbit for 1 hour. Repeated tests showed that the recipient eye had a higher *p*H when treated with a burned cornea than when treated with a section from a normal cornea. From this it was concluded that the alkaline molecules reaching the cornea are bound in some fashion to the epithelial cells and are not removed by prolonged washing with saline solution or water.

Since McLaughlin had experienced good results by removing the epithelium of human eyes which had been burned by alkaline material, these authors applied the same technique to the experimental alkaline burns of the rabbit cornea. They found, contrary to McLaughlin, that any mechanical interference retarded rather than hastened the natural healing process in rabbit eyes.

ROGER H. JOHNSON, M.D.

Arruga, H.: Detachment of the Retina: Pathological and Therapeutic Considerations. *Arch. Ophth.*, Chic., 1946, 36: 531.

Detailed studies of the ocular fundus, and histological examination have demonstrated that in cases of idiopathic detachment the retina is much altered. In many eyes which have not had detachments, atrophic and degenerative lesions which reduce the thickness of the retina (histologically) to one-third normal, are seen. In some eyes retinal holes have been seen without retinal detachment. Therefore, many eyes are predisposed to detachments but do not develop them. It is thought that an adhesion of the retina to the vitreous is necessary to raise and jerk the retina away from the choroid, but if the retina and choroid are tightly adherent, the retina will not detach in spite of this. Trauma is now considered less important than it was formerly. Small tears have a more rapid resorption of the subretinal fluid and a better prognosis than large tears or disinsertions.

Another factor in the formation and cure of detachments is the condition of the choroid. It is thought that little change in the choroid is required to make a detachment possible. A detachment which is replaced by rest has a good prognosis, since the choroid has shown that it is in good condition for reabsorption of fluid. This is necessary for the absorption of exudation caused by future diathermy. If

the choroid does not absorb the subretinal fluid well, the prognosis is not as good. There is also a variable response of the choroid to diathermy; those with less response (no uveitis) have a better prognosis. For this reason it is advisable to localize the diathermic action as much as possible. Immediate repetition of the operation is advisable only when tears appear which were not reached by the preceding diathermy.

Bed rest and binocular bandaging both before and after surgery improve the results of treatment.

ROGER H. JOHNSON, M.D.

Wilder, H. C.: Intraocular Tumors in Soldiers. *Mil. Surgeon*, 1946, 99: 459.

The author reports that he found a number of intraocular tumors in healthy soldiers from 18 to 38 years of age during World War II. True intraocular and potentially neoplastic tumors occurred in 42 (1.08%) of a series of 3,882 enucleated eyes of soldiers who were examined during the period between Pearl Harbor and VJ Day at the Army Institute of Pathology.

The reported series of cases includes benign and malignant melanomas of the uvea, bilateral intraocular metastases from pulmonary carcinoma and from malignant skin melanoma, malignant dyskeratosis in a traumatic intraocular epithelial implant, and Von Hippel's disease.

The type of tumor most commonly observed was a malignant melanoma of the uvea; next in frequency was the benign melanoma. Benign melanoma of the choroid was found in several eyes which were enucleated following trauma—in 1 case of phthisis bulbi, and in 5 cases in which the condition would probably not have been diagnosed in civilian life. Carcinoma of the choroid rarely metastasizes from the lungs. Melanomas in patients under 40 years of age are believed to be less malignant than those which occur in the later decades of life.

The author points out that the percentage of cases of intraocular tumors of the type usually observed was surprisingly low for the large number of patients examined. JOSHUA ZUCKERMAN, M.D.

Sorsby, A., and Ungar, J.: Pure Penicillin in Ophthalmology. *Brit. M. J.*, 1946, 2: 723.

The authors discuss the value of pure penicillin in ophthalmology. Pure penicillin (calcium or sodium) salt is a white crystalline substance which is freely soluble and more stable than commercial (impure) penicillin, and remains stable for months at room temperature. One milligram of pure penicillin corresponds to 1,660 Oxford units. Whether applied locally to the eye as an ointment (containing up to 100,000 units per gram), in aqueous solution, intravitreally, or subconjunctivally, pure penicillin is well tolerated. By the introduction of concentrated ointments into the conjunctival sac, adequate therapeutic levels of penicillin can be obtained in the aqueous. To obtain higher levels, subconjunctival injection is necessary. Systemic administration of massive doses will yield adequate, although evanescent, levels. Adrenalin added to the subconjunctival injection increases persistence; beeswax for intramuscular injection helps to sustain the level of concentration.

Experimentally, infections of the anterior chamber are readily controlled by the use of concentrated ointments, subconjunctival injections, and systemic administration of penicillin; infections of the vitreous are satisfactorily controlled only by subconjunctival injection.

Clinical trials show that the experimental results are applicable to man. JOSHUA ZUCKERMAN, M.D.

Harrington, D. O.: Autonomic Nervous System in Eye Diseases. *Am. J. Ophth.*, 1946, 29: 1405.

In this article the author discusses the clinical manifestations of certain functional and organic eye conditions which have as their common etiology, dysfunction of the autonomic nervous system.

Various conditions in which this subject could be clinically studied were illustrated by patients having (1) central angiospastic retinopathy; (2) ocular changes associated with Raynaud's disease; (3) amaurosis fugax; (4) commotio retinae; (5) migraine; (6) contusion retinopathy; (7) blast concussion retinopathy; and (8) solar retinitis. The autonomic stimulae are enumerated and the importance and frequency of psychic trauma as a cause of autonomic instability are shown. HUNTER H. ROMAINE, M.D.

EAR

Brown, J. B., Cannon, B., Lischer, C. E., Davis, W. B., and Others: Further Reports on the Use of Composite Free Grafts of Skin and Cartilage from the Ear. *Plast. Reconstr. Surg.*, 1946, 1: 130.

Losses of the ala, columella, or tip of the nose, due to trauma, burns, wounds, or operative causes, have always presented a problem in repair. Correction has usually necessitated the utilization of local flaps which may alter a normal feature on, or adjacent to, the nose, or it may be necessary to transfer a remote flap, which requires multiple procedures.

The use of a free transplant from the ear, comprising two surfaces of skin with cartilage between, has made possible these corrections in a single procedure. There is minimal deformity of the ear which is repaired either by closure of the defect, grafting of the raw surface, or the use of a scalp flap.

Further experience with the use of composite free grafts from the ear in columellar, tip, and nostril margin repairs confirm the initial enthusiasm for this method. A total of over 50 operations of this type have been performed, with failure in only 4 instances. NOAH D. FABRICANT, M.D.

MOUTH

Maxwell, M. M., Schork, C. J., and Heidt, E.: The Rationale of Treatment in Maxillofacial Injuries. *J. Oral Surg.*, 1946, 4: 269.

The dual purpose of this article is to stress the necessity of adhering to a logical sequence of treat-

ment factors in the successful management of complicated jaw injuries and to emphasize pertinent fundamentals of concern to the oral surgeon.

In hospital practice the handling of these cases is a mutual responsibility of various services, of which the dental, the plastic or orthopedic, and neurosurgical play the principal roles. It is of the utmost importance that the closest possible liaison exist between these services in the development of a rational plan of procedure. When a number of operations are involved in a case of maxillofacial reconstruction, these operations should be performed in a sequence conducive to the best end result. For example, it would be inadvisable to make a plastic repair on a collapsed jaw and thus render it more difficult for the oral surgeon to restore masticatory function. Conversely, it would be equally inadvisable to attempt immobilization of the jaws in the presence of severe systemic disorders requiring precedence in treatment.

Experience gained from World War I demonstrated the need for maxillofacial teams composed of various specialists working closely together to serve the best interests of the patient. Reports indicate that these teams, as used in the Services, have made a substantial contribution to improved treatment in World War II. However, it is believed that even better results are possible of attainment when the various specialists making up these teams have a broad understanding and some training in mutual fields of endeavor. The establishment of treatment centers, staffed by competent, co-operative maxillofacial teams, seems to be the solution to the problem of providing the best possible attention and care for the more complicated cases of face and jaw injuries.

The time of treatment for maxillofacial cases is frequently as important as the nature of the treatment rendered. Indeed, it may be said that favorable prognosis for these cases is dependent upon two factors: the time of treatment as well as the nature of the treatment. With the passage of time, if no treatment or simply symptomatic treatment is rendered, the prognosis becomes progressively more unfavorable. It is obvious that definitive treatment for these cases is considerably handicapped by the formation of cicatricial tissue, by bony consolidation in malunion, and by the inception of avoidable infection.

This article is divided into four parts with emphasis upon the oral surgeon's responsibilities at the time that maxillofacial cases come under his care.

Four cases are presented with many photographs and detailed descriptions of the management of each case.

JOHN F. DELPH, M.D.

Bernier, J. L., and Thompson, H. C.: The Histogenesis of the Cementoma. *Am. J. Orthodont.*, 1946, 32: 543.

Fifteen cases of cementoma are reported and discussed. This material is presented with the suggestion that the reaction of the periodontal membrane in the production of the cementoma may be essentially similar to the process resulting in the formation of ossifying fibromas, fibrous osteomas, and fibrous dysplasia of bone.

If this analogy is true, then one is not entirely justified in assuming that the cementoma is a rare tumor. It likewise becomes important, then, to place more stress on the histological analysis of such lesions if an accurate diagnosis is to be forthcoming.

NOAH D. FABRICANT, M.D.

PHARYNX

Reeves, E.: Hemostasis after Adenoid Operations. *Laryngoscope*, 1946, 56: 616.

Formerly there was a greater percentage of tonsil bleeding than of adenoid bleeding than at present following a tonsillectomy-adenoidectomy operation. The greater incidence of adenoid bleeding today may be explained by the fact that greater care is now made to stop tonsillar fossa bleeding completely while bleeding from the adenoid fossa is somewhat neglected. Postoperative bleeding from the adenoid fossa can be very serious and difficult to control. Therefore, more care should be taken to stop completely all bleeding before the patient leaves the operating room.

Care should also be taken before operation to rule out any blood or infectious disease which may cause bleeding. It is better to avoid adenoidectomy in any case of elevated fever, during the menstrual period, in the presence of secondary anemia, or during the treatment of syphilis by arsenic or bismuth. It is advisable to determine the bleeding and coagulation times of all patients prior to operation.

There are 5 generally accepted methods of hemostasis after adenoidectomy and tonsillectomy: the plain ligature, the suture ligature, packing, electrocoagulation, and infiltration of the tissues with novocaine and adrenalin.

Reeves gives a detailed description of the anatomy of the nasopharynx and distribution of the pharyngeal tonsils. The blood supply and venous drainage is briefly discussed.

There are several methods of doing an adenoidectomy. Reeves uses the method described by Fetterolf with slight modification. This consists of removing the adenoids with a LaForce adenotome following the tonsillectomy. A curette is then used, if necessary. A Tieman elevator is then introduced to obtain a view of the fornix and a punch of the Myles type is used to remove any remnant of adenoid tissue, loose mucosal tags, and the thick, infiltrated mucosa of the posterior wall.

Following this, any bleeding from the tonsillar fossa is stopped and the adenoid fossa again examined. If any bleeding is present, it is usually from the edge of the cut mucosa. The author describes in some detail the application of a modified Coakley slipknot of No. 1 plain catgut to stop this bleeding. If bleeding is present from an area where a plain ligature cannot be used, a suture ligature may be of value, but care must be taken not to injure the im-

portant levator veli and salpingopharyngeal muscles. The method of injection and the technique of retronasal packing is discussed. Electrocoagulation may be necessary, but Reeves does not often use that method.

When secondary bleeding occurs from the adenoid fossa, an attempt should be made to find the cause. Several causes are mentioned. Control of this type of bleeding is similar to that mentioned, but it is usually accomplished by removal of the clot and dropping adrenalin into the nose to reach the bleeding area. Supportive treatment is frequently necessary as is the use of drugs to increase the clotting of the blood. WILLIAM A. AHROON, M.D.

NECK

Lerman, J., Jones, H. W., and Calkins, E.: Studies on 2 Sporadic Cretinous Brothers with Goiter, together with Some Remarks on the Relation of Hyperplasia to Neoplasia. *Ann. Int. M.*, 1946, 25: 677.

The results of studies made on 2 cretinous brothers are presented in detail, along with brief clinical histories. The records of 2 other cretins with goiter seen previously were re-examined. The relationship between hyperplasia and neoplasia is discussed. Experimental findings in cases in which thyroid carcinoma was produced by thiouracil in the treatment of hyperthyroidism are considered. It was suggested that thiouracil be used only as a preliminary medication in preparing the patient for thyroidectomy.

RICHARD J. BENNETT, JR., M.D.

Beierwaltes, W. H., and Sturgis, C. C.: Complications following the Administration of Thiouracil. *Am. J. M. Sc.*, 1946, 212: 513.

The author, after reviewing 7 fatalities from agranulocytosis following the administration of thiouracil, concludes that the most effective therapy for this condition is the early administration of penicillin. Also, the symptoms of fever, malaise, or sore throat occurring in a patient under treatment with thiouracil, if properly evaluated, will lead to earlier recognition of the agranulocytosis and earlier stoppage of the offending drug. The author also concludes that thiouracil should be stopped when the white blood cell count drops below 2,000 per cubic millimeter.

A series of 80 patients was treated with thiouracil. Five patients (8 per cent of the group) developed neutropenic leucopenia or agranulocytosis. The author believes that often in cases of neutropenic leucopenia after temporary stopping of the thiouracil it may again be administered with satisfactory results. However, 1 of the 2 patients in this series that developed agranulocytosis developed a recurrence when the drug was resumed. There were no fatalities from agranulocytosis in this series. In only 1 of the 80 patients was it necessary to discontinue thiouracil because of a febrile reaction. In 2 of the 80 patients the results of thiouracil therapy were thought to be only moderately successful, and thyroidectomy was performed. This was done in spite of the fact that the basal metabolic rate was reduced to within normal limits in both cases. Because of the incidence of carcinoma in patients with nodular goiter, thiouracil is used only as a preoperative measure in these cases. In the 1 case of dermatitis which appeared in this series the drug was successfully readministered following the disappearance of the rash. Leg edema and jaundice were not observed in this series.

The author does not believe that there is a higher incidence of progressive exophthalmos in patients treated with thiouracil than in those in whom a thyroidectomy is performed. He now uses thiouracil plus desiccated thyroid to treat malignant exophthalmos. He believes that thiouracil is superior to iodine for preoperative preparation of patients with hyperthyroidism. F. J. LESEMANN, JR., M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Lysholm, E.: Experiences in Ventriculography of Tumors below the Tentorium. *Brit. J. Radiol.*, 1946, 19: 437.

This memorial lecture was delivered in April, 1946 to honor Mackenzie Davidson, the well known British radiologist. The subject matter has to do with 467 infratentorial lesions examined by ventriculography from 1930 to 1946. One hundred and four cases had previously been discussed in an article published in 1935, to which the author refers us in regard to his technique. This technique has not changed in any essential detail; neither laminography nor tereoscopy are used for it has always been possible to visualize the aqueduct and the third and fourth ventricles. The anatomy of the structures to

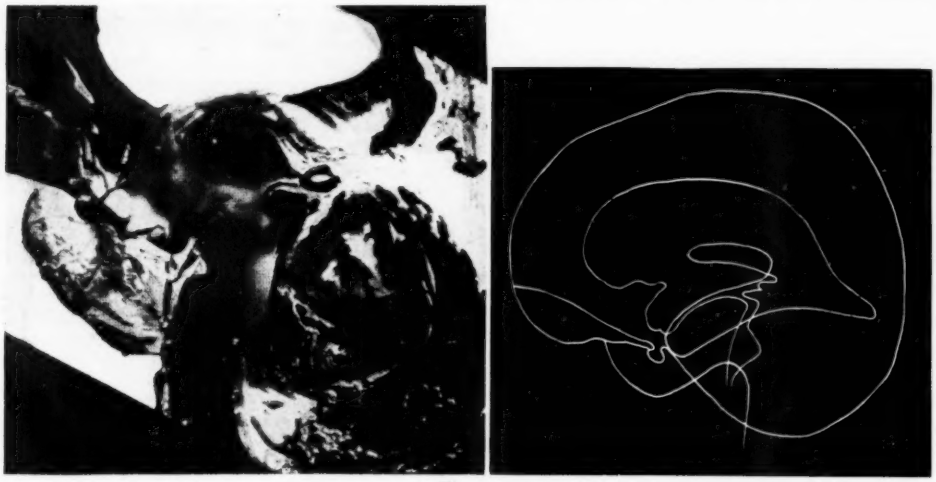

Fig. 1.

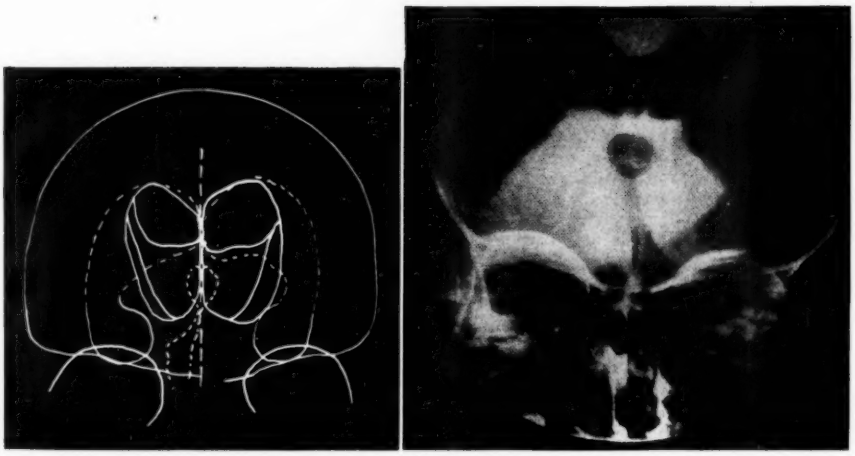

Fig. 2.

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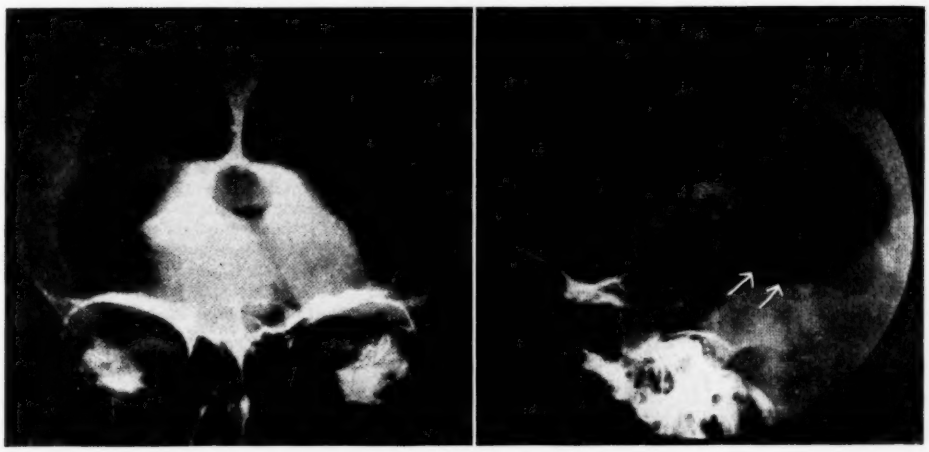


Fig. 3.

Fig. 1. (Lysholm) Left, Pathological specimen of suprafastigial midline tumor (Vermis); Note kink; right, drawing of suprafastigial midline tumor.

Fig. 2. Left, Drawing of typical hemisphere tumor showing displacement of aqueduct and fourth ventricle (frontal); right, frontal roentgenogram of hemisphere abscess. Right hemisphere expanding process (verified abscess). Moderate symmetrical hydrocephalus. Kink in middle of aqueduct. Fourth ventricle and aqueduct displaced forward and slightly to the left.

Fig. 3. Left, Frontal roentgenogram. Lateral displacement of aqueduct and fourth ventricle; right, lateral roentgenogram of same case. Cerebellopontine angle glioma (medulloblastoma verified). Symmetrical moderate hydrocephalus. Aqueduct and fourth ventricle displaced to the right. Aqueduct displaced somewhat backward. At operation the tumor was found in the right cerebellopontine angle growing in the pons and right cerebellar hemisphere.

TABLE I.—VERIFIED CASES OF INFRATENTORIAL LESIONS INVESTIGATED BY VENTRICULOGRAPHY, FROM 1930 TO 1946

	No. of cases	
Expanding lesions in the posterior part of the third ventricle (mostly pinealomas)		62
Aqueduct stenosis	63	
Corpora quadrigemina	22	
Pons region	24	
Cerebello-pontine angle (21 of these = acoustic tumors)	36	
Vermis and fourth ventricle, above fastigium	77	
Vermis and fourth ventricle, below fastigium	110	
Cerebellar hemispheres	100	
Arachnoiditis	35	
Total infratentorial lesions	467	
Borderline cases between the medulla and cord		3

be examined is stressed and three projections, in different planes, are taken in any one position of the head.

The presentation is really a series of 56 pictures of pathological specimens, special views of the head with air or oxygen in the ventricular systems, and diagrams. Table I is descriptive of the material that forms the basis of the demonstration.

Although the series shows great accuracy in the localization of tumors below the tentorium, it was pointed out that this method must be used in conjunction with careful general and neurological examinations. Certain errors managed to creep in. For instance, there were 42 negative ventriculographies for suspected expanding lesions of the posterior fossa of which 36 were never explored. Of the remaining 6 cases, 5 were explored with the following verified results: 1 stem tumor, 2 meningiomas, 1 acousticus tumor, and 1 fourth ventricle tumor. The sixth case was diagnosed clinically as a pons tumor and x-ray treatment was given. The patient died 3 months later but an autopsy was not obtained.

ADRIEN VER BRUGGHEN, M.D.

Cramer, F. J.: Surgical Treatment of Syringobulbia and Syringopontia; Report of 2 Cases. *Arch. Neur. Psychiat.*, Chic., 1946, 56: 442.

The author has presented 2 cases of syringobulbia and syringopontia which were treated surgically with the belief that they are the first so reported in the literature. The indications for operation in cases of these disorders were listed as being identical with those for syringomyelia, namely, rapid progression of the symptoms, increase of the intracranial pressure, cerebrospinal fluid block, and accurate neurological localization.

Syringomyelic types of lesions have been known to occur with the Arnold-Chiari syndrome. The author observed in the first case that the cerebellar tonsils were herniated into the spinal canal, but since this area was not explored it was impossible to say

whether the tonsils were attached to the cord. However, the fact that the medulla and the fourth ventricle were in their usual position without any traction exerted upon them, and the fact that there were no bony defects found in the skull, indicated that the cavitation did not result from an extra-axial cause.

Likewise, it has been reported by other observers that arachnoidal adhesions have occurred in certain cases of Arnold-Chiari deformity with associated underlying syringomyelic lesions. The author stated that in spite of the fact that there was a thickening of the arachnoid membrane with vascularization of the syrinx there was no possible etiological relationship between the two, for the cyst was primarily in the medulla and the adhesions were atlanto-occipital. Adhesions can be regarded as a causative factor only when they are bandlike and constricting in character.

The pathological process involved in syringomyelia and the associated conditions was discussed. These congenital anomalies are developed from ectopic glial cells which undergo both growth and degeneration. Symptoms are produced: (1) by direct involvement of the cranial nerve nuclei and the fiber tracts, (2) by disturbance of the vascular supply to normal neural tissue, and (3) by direct increased pressure of the fluid and degenerated products within the syrinx upon the surrounding tissues.

The problem of obliterating the cavity or maintaining the communication between it and the subarachnoid space was considered. It was the opinion of the author that the production of fluid within the syrinx is on the basis of degeneration of abnormal cells and not due to the secretion of new material. The final stages of this destruction of tissue was regarded as being present in most cases which required operation, and it was believed that recurrence of the cyst would not take place at the point where operation had been performed.

Postoperatively, the 2 patients whose cases were presented showed a definite relief of increased intracranial pressure and no further advance of the pathological process 14 and 18 months after operation, respectively. On the contrary, the second case even had some regression of symptoms because the signs were on the basis of edema, which subsided, and the patient was able to return to work. These factors suggest that operation should be undertaken in these conditions when the afore mentioned criteria for operation are noted. RICHARD C. SCHNEIDER, M.D.

Van Wagenen, W. P.: Observations on Changes in States of Mental Depression and Tension following Surgical Section of Certain Frontal Lobe Pathways. *Surgery*, 1946, 20: 656.

The author reports 4 cases in which various surgical sections have been undertaken in the treatment of severe mental depression.

The first case was that of a male with mental depression sufficient to incapacitate him for work. A bilateral prefrontal lobotomy, as described by Freeman and Watts, was performed and a satisfactory result was obtained. The patient returned to work.

The second patient, a sister of the first patient, also with marked mental depression, was treated first by preliminary burr holes over the coronal sutures on both sides, and opening of the dura; however, no section of the white matter was carried out, and the patient's condition remained unchanged. Nine days later, through an osteoplastic flap, the anterior portion of the corpus callosum was divided, as well as the anterior commissure and the right limb of the fornix. An incision was made into the white matter anterior to the caudate nucleus on both sides, and an estimated area of from 1 inch to 1¼ inches square was sectioned. A completely satisfactory result was obtained following this procedure.

The third patient, a male, aged 44, also with severe mental depression and ideas of persecution, was operated upon with essentially the same procedure as that described in case 2. Again, a satisfactory result was obtained.

The fourth patient, a female, aged 50, with extreme nervousness and emotional instability and depression, was treated by a left prefrontal lobotomy (Watts' technique). No essential change in her mental state resulted. Three weeks later the anterior half of the corpus callosum was divided, and a section of the right prefrontal white fibers anterior to the caudate nucleus was planned, but could not be carried out because of technical difficulties. The patient showed only slight improvement in mood; there was no other change.

The author believes that the results obtained in these cases support the belief that bilateral division of the white fiber pathways between the basal ganglion and the frontal lobe cortex is sufficient to secure relief from states of mental depression and tension. Section of more white fibers may be unnecessary. He also points out that prefrontal lobotomy, as described by Watts, is a more practical procedure and is attended by less surgery and considerably less risk than the section described. He concludes that division of the white fibers in the corpus callosum is not followed by any change in states of mental depression or tension. HOWARD A. BROWN, M.D.

Horrax, G.: Experiences with Cortical Excisions for the Relief of Intractable Pain in the Extremities. *Surgery*, 1946, 20: 593.

The author reports the cases of 4 patients with intractable pain in the extremities, who were treated by excision of the postcentral sensory cortex.

The first patient had had both arms amputated above the wrists, and in this case bilateral excision of the sensory cortex was done in two stages. Temporary relief of pain resulted following each excision, but the pain factors began to return at the end of a week, and within 2 weeks the pain was as severe as it had been before operation.

The second patient suffered intractable pain in the right hand and arm. The pain was thought to be due to some pathological condition involving the cervical roots, which had failed to respond to two laminectomies. Excision of the postcentral sensory

cortex resulted in very little temporary benefit, but the patient was addicted to morphine, which presented an added problem. The author considered this case also essentially a failure.

The third case was that of a patient with intractable pain involving the right arm and leg, secondary to a deep-seated tumor. Removal of the tumor, and x-ray therapy gave relief for a time. Upon the return of pain, excision of the sensory cortex was done with relief of the pain, although with considerable increase in motor disturbance and transient aphasia. The pain returned in the arm area after 5 months, although the leg and foot were still comfortable.

The fourth patient had severe pain in the right hand and arm, secondary to a tumor which had been previously removed in part. Following excision of the sensory cortex, there was paralysis of the arm and weakness of the leg, but relief from pain was had for almost a year, at which time the patient succumbed as a result of the tumor and a pontine hemorrhage.

In each case the sensory area was mapped out by electrical stimulation, and the author reports that in 3 out of 4 patients pain could be produced by stimulation of the cortical sensory areas.

The first 2 cases were considered failures, while results in the last 2 were considered relatively successful. HOWARD A. BROWN. M.D.

Nordén, A.: Peripheral Injuries to the Spinal Accessory Nerve. *Acta chir. scand.*, 1946, 94: 515.

A review of 16 cases of peripheral injury to the spinal accessory nerve calls attention to an apparently completely overlooked condition of incapacitating pain and weakness in the involved arm and shoulder.

Both the sternomastoid and trapezius muscles are doubly innervated, the former by the second and third cervical and the latter by the third and fourth cervical nerves, as well as by the spinal accessory nerve. The anatomical course of the eleventh nerve is noted and its susceptibility to injury is pointed out—in cases of surgical intervention for the removal of tuberculous lymphomas, in biopsies, in direct contact with blunt instruments, and in trauma from gunshot wounds.

The symptoms consist of a feeling of heaviness in the arm, inability to lift the shoulder, and pains of a dull aching type originating in the shoulder and radiating down the medial border of the scapula into the arm. The latter may be present on either the radial or ulnar side of the arm.

In 7 cases there were paresthesias in the form of numbness, prickling, or throbbing sensations in the shoulder, arm, or hand. On exertion, both pain and paresthesias in the extremity were increased in all cases.

Objectively there is paresis of the sternomastoid and trapezius muscles with associated atrophy. In the case of the latter muscle, this is not complete because of the double innervation of the muscle. Reflexes of the arm are normal, and in no case is variation of the radial pulse noted; however, only 6 of the cases were observed for this factor.

Pains are of two varieties: (1) those due to depression of the shoulder with tension on the brachial plexus, which tend to disappear upon supporting the extremity (apparently no part of the plexus is routinely involved because numbness may be present in part or all of the extremity); and (2) those due to periarthritis and peritendinitis secondary to disuse of the extremity.

Two of the 16 patients were without any pain but had pronounced paresis; the remainder, a majority of the patients, had pain in varying degrees, which more or less interfered with their ability to earn a livelihood.

The most satisfactory method of treatment, of course, is prophylaxis. For operations in this area, it is believed that the spinal accessory nerve should first be sought and identified before any tissue is excised. A less risky zone should be selected for biopsy, and if this is not possible the procedure should be carried out on the left side of the neck in right-handed individuals, where bilateral nodes are available. In cases of paralysis of the seventh nerve, in which anastomosis operations are necessary, it is suggested that the twelfth nerve be used instead of the spinal accessory nerve, thereby causing less discomfort to the patient.

Once the injury has been sustained, active treatment consists in suture of the nerve within 2 to 3 weeks. Orthopedic bandages have been suggested, but are believed to be unsatisfactory. Muscle and fascial plastic procedures are of avail in some cases for support of the scapula. X-ray therapy and exercise are advocated for associated periarthritis and peritendinitis. RICHARD C. SCHNEIDER, M.D.

SPINAL CORD AND ITS COVERINGS

Fincher, E. F.: The Differential Diagnosis of Intervertebral Cartilage Ruptures and Intraspinal Tumors within the Lumbar Sacral Canal. *South. Surgeon*, 1946, 12: 292.

The increasing notoriety and popularity of the "ruptured disc" has served to focus diagnostic attention on the fact that radiating nerve root pain is more likely to be of mechanical origin than the result of so-called inflammatory or other intrinsic changes in the nerve structures. The "disc" possibility as a cause for a lumbago-sciatica syndrome has had its influence in bringing about earlier recognition of spinal cord tumors. The differential diagnosis in these two groups is by no means always easy. In the fullblown late developments of spinal cord tumor, the diagnosis is not difficult and can be accurately made from a neurological examination. With the history of a specific initiating low back trauma and a subsequent sciatica, a "disc" rupture is quite likely the accurate diagnosis, but such symptoms may indicate an intraspinal tumor within the lumbar spinal canal.

In a large series of patients with clinically diagnosed ruptured lumbar intervertebral cartilages, who were incapacitated by their sciatic pain which conservative treatment had failed to relieve, it was found that approximately 1 per cent of the group had intraspinal tumors. It was learned further, from a study of clinically diagnosed tumors, that a higher percentage had completely herniated (either a full annulus or a nucleus pulposus, or both, into the lumbar spinal canal) to produce a complete obstruction. These two groups, (1) the tumors diagnosed as discs and (2) the discs suspected as being tumors, form the basis of the present communication.

The subjective symptoms of these two groups of patients may serve to be very misleading in the clinical diagnosis. The history of trauma may be elicited in approximately 85 per cent of the cases of intervertebral disc.

In about one-third of the cases a history of exacerbations and remissions of symptoms was obtained, the remission of symptoms usually following bed rest. In the cases of intraspinal tumors, there was no frank evidence that prolonged bed rest of the patients contributed to the alleviation of nerve root pain. The author points out that a general clinical rule might be that "disc patients lie and tumor patients walk" for relief of their nerve root pressure symptoms.

Intensification of sciatic pain on coughing and sneezing has been stressed as an important clinical sign of a ruptured disc. Occasionally this is true of tumor patients. Activities that entail low back bending are more likely to intensify the symptoms of ruptured disc, than those of tumors. In the case of ruptured discs, there is a tendency for a "list" to the nonpainful side. Subjective motor handicaps are infrequent in both tumors and ruptured discs. An acute complete rupture of a disc may precipitate a frank paralysis of dorsiflexion of the feet. A footdrop in a tumor patient develops instantly and is rather a latent manifestation of nerve root damage. Patients with ruptured disc are more prone to notice calf atrophy than are patients with tumor. In general, paresthesias of a ruptured disc are referable to one lower extremity, whereas, in cases of tumor they are referable to both lower extremities. Muscle spasm of the lumbar erecti group is strikingly absent in cases of tumor, and a rather constant finding in cases of ruptured disc.

The author discusses the investigative procedures which are: roentgenography of the lumbosacral vertebra, spinal puncture with manometric determination and fluid studies, and occasionally contrast media visualization of the spinal canal. He states that there is no necessity to make these procedures a routine in clear-cut cases of ruptured disc, but they are used when necessary for the making of a differential diagnosis. He also calls attention to the use of the exploratory operation for cases in which the diagnosis is in question. As a general rule, this is also a therapeutic procedure.

PAUL MERRELL, M.D.

PERIPHERAL NERVES

D'Aubigné, R. M.: The Treatment of Loss of Substance in Nerves (A propos du traitement des pertes de substance nerveuse). *Mém. Acad. chir.*, Par., 1946, 72: 409.

Since October, 1945, 100 peripheral nerve lesions, of which 59 had loss of substance, were treated at a surgical center. Because nerve grafts were considered unsatisfactory, every effort was made to obtain end-to-end suture and it was found that unexpectedly large gaps could be closed; for instance, 10 cm. in the median nerve, 10 cm. in the ulnar, 8 cm. in the radial, 10 cm. in the sciatic, and 7 cm. in the common peroneal nerve. It is true that these long distances were covered in only single cases except in the instance of the radial nerve in which it was possible to gain 8 cm. on 2 occasions. Every available method was used to obtain closure of the gap, including extensive mobilization of the nerve, transposition of the nerve, flexion of the joints, and, in 4 cases, shortening of the long bones. Only 20 cases could be followed up and among these there were 12 regenerations and 8 failures. As would be expected, the length of the gap that must be bridged bears some relation to the result. In 5 cases in which the gap was 4 cm. or under there were 5 cures, but when the distance was over 4 cm. the results deteriorated by 50 per cent. The following table is a summary.

TABLE I.—LENGTH OF LOSS OF SUBSTANCE

	Cure	Failure
Less than 4 cm.	5	0
4 to 6 cm.	3	1
6 to 8 cm.	2	3
8 to 10 cm.	1	2
over 10 cm.	1	2
	12	8

In some cases a graft has to be used, and on experimental grounds the autograft should be the most useful. This was proved to be the case clinically. The author's results with autografts and auto-cable grafts are not given. ADRIEN VER BRUGGHEN, M.D.

D'Aubigné, M.: The Treatment of Loss of Substance of the Peripheral Nerves (Traitement des pertes de substance des nerfs périphériques). *J. chir.*, Par., 1946, 62: 292.

The ideal goal of all treatment of loss of substance of the peripheral nerves is the complete restoration of the function which had been interrupted by the trauma. This can be reached only if the axons growing from the central stump are permitted to enter into the Schwann tubes of the peripheral stump and to reach their sensitive or motor end-organs.

If it is ever possible, the direct end-to-end suture is preferable to grafting. Even if there is a considerable gap between the two ends, they can be approximated by different procedures:

1. Dissection of the nerve to a great length. By this technique alone, from 5 to 6 cm. of length can be

gained in dissection of the median nerve. It is true that by very extensive dissection the vascularization of the nerve and, consequently, its function and regeneration may be jeopardized; however, experience shows that, because of a network of intraneural anastomoses, the resistance of the nerve to ischemia is remarkable. In any case, a dissected nerve will be always better vascularized than a graft.

2. Further length can be won by transposition, i.e., by changing the normal course of the nerve. This is true particularly for the ulnar nerve. Here, the transposition of the nerve anterior to the epitrochlea, combined with flexion of the elbow, permits end-to-end suture even in losses of up to 10 cm. of nerve substance.

3. Additional length can be gained by appropriate position of the limbs. In the upper extremity, adduction of the shoulder and flexion of the elbow permit repair in lesions of the median, radial and ulnar nerves.

4. Suture in two stages has been suggested when approximation is impossible with the afore described methods; however, the results are not satisfactory, and the method has been given up by the majority of French and British surgeons.

These mechanical devices for lengthening the nerve make end-to-end suture possible if the loss of nerve substance does not exceed 12 cm. in the sciatic, 12 cm. in the median and ulnar nerves, 8 cm. in the radial nerve, and 10 cm. in the popliteal nerve. If none of these methods is applicable, there is finally the possibility of shortening the limb by resection of the bones. The applicability of this heroic method is, however, quite limited; it is justified only for the humerus if there is delay in union of the fractured bone in addition to the nerve injury.

The suture should not be made immediately after the injury. Statistical papers as well as histological examinations have proved definitely that the early secondary suture is much superior to the primary suture. The best time for the intervention is between the nineteenth and twenty-fifth days after the injury, this being the period of maximal proliferation of the Schwann cells.

If direct suture is definitely impossible, grafting is indicated. Three kinds of graft are possible: heterografts, i.e., replacement by animal nerves (dog, cat, or rabbit), homografts, in which nerves from the amputated limbs of other patients are used, and, finally, autografts, in which cutaneous nerves of the patient are transplanted to the injured nerve. The results of the heterograft method have been rather disappointing, and it has been condemned practically unanimously by American and British authors. In contradistinction to this negative attitude, the most recent publications of French and other European authors report partial or complete regeneration in about 30 per cent of the cases. It seems to be important that the grafted nerve is living tissue (fresh dog nerve). In any case, the heterograft should be reserved for cases in which no other method is possible.

The results of the homograft method have been equally disappointing, as the transplanted nerve usually becomes necrotic and is replaced by bands of fibrous tissue.

The results of the autograft method have been much more encouraging. French, as well as American, authors reported success with autografts of the radial and median nerves up to a length of 15 cm. Here, the main problem is to find a sufficient amount of material for the transplantation without causing functional damage. In most cases the internal cutaneous brachial or the external saphenous nerves are employed. As these nerves are of small diameter, they have to be tripled or quadrupled to replace loss of substance in larger nerves (cable technique). The smaller the diameter of the transplanted nerves, the better is the prospect. Small nerves are supplied with nutrient by the environmental tissue whereas large nerves, when grafted, necrotize in the center. As suture material, either human hair or thread of tantalum seems to give the best results. The most difficult problem is presented by the sciatic nerve because of its large caliber.

It is essential to resect the stumps, especially the distal one, before suture or graft is made to make sure that the operation is performed in healthy tissue. Most failures are caused by insufficient excision of the sclerotic tissue at the distal stump. Some men prefer to glue the stumps together with plasma or to apply cuffs of metal or other material rather than to suture. In case of failure to restore the nerve function, palliative treatment must be applied. Motor paralyses can be compensated for in many cases by tendon operations, arthrodeses, and arthrorises.

WERNER M. SOLMITZ, M.D.

Wertheimer and Mathieu: Results of Surgical Treatment in Wounds of Peripheral Nerves with Loss of Substance (Résultats de la thérapeutique chirurgicale dans les plaies des nerfs périphériques avec perte de substance). *Mem. Acad. chir.*, Par., 1946, 72: 398.

This is the first group of cases reported by a French author concerning patients seen in the 1939–40 campaign and that of 1944–45 who received surgical treatment for wounds of the peripheral nerves with loss of substance. All patients were operated on under the direct supervision of one person and therefore present a group treated in a uniform manner. Follow-up reports of some of the cases were unobtainable because of transfers in North Africa and return of the patients to their country. Some cases are too recent to be of value.

In all, 61 observations were made, and a comparison was made between direct suture by mobilizing the nerve and flexing the joints over which it runs with immobilization, and the results obtained by various forms of nerve grafts. The types of nerve grafts used were: heterografts, with the spinal cord of the rabbit or cat, 11 cases; autografts, usually with the medial cutaneous nerve of the arm, 10 cases; and homografts, from amputated limbs, 9 cases. Only

TABLE I.—THE TIME FACTOR IN RESULTS

Immediate suture	2 Cases	100% successful
During the first month	3 Cases	33% successful
During the second and third month	7 Cases	43% successful
During the fourth and fifth month	11 Cases	27% successful
During the sixth and seventh month	4 Cases	25% successful
From seven months to a year	8 Cases	0% successful
After a year	3 Cases	0% successful

1 autograft was a success and it was used on the ulnar nerve in the arm; 25 months after operation the patient had only some weakness in the abductor digiti quinti. One other autograft and 2 homografts showed slight evidence of regeneration.

In direct suture of nerves, in contrast to nerve grafting, the results depend on the wounding agent and the time of suture. For instance, the same author states that in civil practice there were failures in 45 per cent of the cases, whereas in military practice there were failures in 60 per cent.

ADRIEN VER BRUGGHEN, M.D.

MISCELLANEOUS

Van Rijssel, T. G.: Circulation of the Cerebrospinal Fluid in Carassius Gibelio. *Arch. Neur. Psychiat.*, Chic., 1946, 56: 522.

Controversial opinions regarding the origin, movement, pathways, absorption, and function of the cerebrospinal fluid are prevalent in the literature. To determine the extent of the perivascular spaces and circulation of the cerebrospinal fluid in these areas the following experiments were undertaken. A species of carp, Carassius gibelio, was selected because its anatomical features facilitated such a study. Eight fish were allowed to swim in solutions of trypan blue. Subsequent examination revealed that dye failed to enter the central nervous system. Thus, a blood-cerebrospinal fluid barrier exists for trypan blue.

To trace the flow of cerebrospinal fluid, dye (trypan blue or India ink) was injected into the pericerebral spaces of these fish and microscopic examination of serial sections was made. The fish were killed at varying intervals of time following the injection. The significant facts revealed were:

1. Perivascular spaces occur in the brain of Carassius gibelio and these are in open communication with the meningeal spaces and the ventricles.

2. Particles of trypan blue or India ink pass through these routes from the meningeal or ventricular spaces into the perivascular spaces.

3. Movement within the perivascular spaces occurs in the same direction as that in which the blood flows and is attributed to the vessel pulsations.

4. An extensive interchange of cerebrospinal fluid takes place between the ventricular fluid, or internal cerebrospinal fluid, and the external fluid, or that surrounding the brain in the meshes and chambers of the meningeal tissues. This exchange occurs through the thin roof of the third ventricle and the perivascular spaces of the vessels reaching the surface of the brain from the ventricle.

5. The choroid plexus of the fourth ventricle absorbs colloidally suspended particles from the ventricular fluid.

6. There is a strong blood-cerebrospinal-fluid barrier and a less absolute cerebrospinal fluid-parenchymal barrier for trypan blue. The latter of these barriers is stronger with respect to India ink.

C. FREDERICK KITTLE, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Aiken, D.: Brodie's Disease of the Breast. *Brit. J. Surg.*, 1946, 34: 87.

Unusually large noncancerous breast tumors were recognized early in the ninteenth century. Brodie, in 1846, and his contemporary, Cooper, regarded the neoplasm as an advanced stage of cystic disease of the breast. Brodie's penetrating observations and gift of graphic description earned him the deserved honor of the eponym. There have been only 125 cases recorded to date in the medical literature.

The term "Brodie's tumor" should be reserved for large, excessively cellular and long-neglected fibroadenomas. The history of a pre-existing breast tumor of many years' duration which at first grows slowly or not at all and, finally, in late middle age increases rapidly in size, is the outstanding feature of this tumor. Commencing as a fibroadenoma, it maintains the characteristics of an innocent lesion throughout. The skin overlying the tumor is mobile, there is no fixation to the deep structures, and the lymph nodes are not usually involved, apart from the hyperplasia due to inflammatory changes. Enlargement may be so great that ulceration of the skin results from pressure necrosis, and the foul, fungating mass in a patient past middle life at once suggests a carcinoma. Sometimes, the correct diagnosis of an innocent large tumor is impossible until the breast is removed. One striking clinical feature in typical cases is the excellent general condition of the patient.

Local recurrence following excision of the tumor has been reported on rare occasions, especially by the earlier writers, and convincing evidence of malignancy is even rarer.

The cut surface of a Brodie's tumor reveals an encapsulated mass showing white whorled areas, deep clefts, and translucent lobules, some of which degenerate into cysts. Microscopically, its structure is that of an intracanalicular fibroadenoma which has become very cellular and shows degeneration and even cystic softening. In the cellular areas of the fibroblast dividing cells may be found, but the mitoses are regular. It is this appearance which may lead to the diagnosis of sarcoma.

The best treatment of Brodie's tumor appears to be simple mastectomy, rather than local excision, for care must be taken not to leave any breast tissue behind in the skin flaps. It is possible that recurrence of the tumor may take place from a fragment remaining *in situ* as in simple tumors of the parotid gland. It has been suggested that the rapid growth of these fibroadenomas in late middle life may be associated with diminished estrogenic activity.

The author reports a case of a 68 year old woman who presented the described picture. A simple mastectomy was done. One year later there was no evidence of recurrence. LEE PULLEN, M.D.

Ragnell, A.: Operative Correction of Hypertrophy and Ptosis of the Female Breast: 300 Cases. *Acta chir. scand.*, 1946, 94: Supp. 113.

Plastic surgical procedures for the correction of hypertrophy and ptosis of the female breast are presented in a complete and detailed monograph. The subject matter is presented in four parts, and a comprehensive bibliography greatly enhances the value of the report. Results and criticisms of the author's methods, evolved over a series of 300 cases in the past 9 years, are forthrightly presented.

Part 1 is devoted to embryology, physiology, and anatomy. The circulatory system of the breast, both blood and lymph, receives the greatest attention. From an analysis of the investigations of numerous anatomists, it appears that the individual breast may have a variable blood supply with the internal mammary and long thoracic arteries always present, and the third to seventh intercostal arteries usually present, but supplying blood in a somewhat different degree. The areola and nipple usually form a splendid anastomosis from the first two arteries, with the aid of the intercostal arteries in some instances. In some breasts, however, this area is supplied by end arteries, and as there is no way of determining such a condition in advance, due caution is always necessary. There are no universal laws for circulation in the mammilla. Nerve supply, lymph circulation, and the physiology of lactation are discussed.

In part 2, a classification of breast deformities is attempted. The groupings of various authors are presented, and the author suggests the following classification, which he uses:

1. Bilateral overdeveloped breasts with and without ptosis.
2. Breasts of normal size with ptosis.
3. Bilateral underdeveloped breasts with and without ptosis.
4. Asymmetrical breasts, over or under developed, with and without ptosis.

Causative factors of the different types of breast deformity are discussed.

With regard to the indications and contraindications for plastic surgical procedures, consideration should be given to (1) the symptoms complained of by the patient (as often mental as physical), and (2) the skill and experience of the surgeon.

A thorough discussion, with excellent illustrations of the several more or less classical procedures of Passot, Biesenberger, Gillies-McIndoe, and Maliniak, and criticisms of each procedure, follow. Once again, great emphasis is placed on circulatory considerations. Loss of the nipple and areola, is, of course, the paramount apprehension in reconstructive procedures of the breast. Practically all authors agree that venous stasis is the predominant cause of necrosis of the nipple. The innervation and lactation of breasts following surgery are briefly discussed.

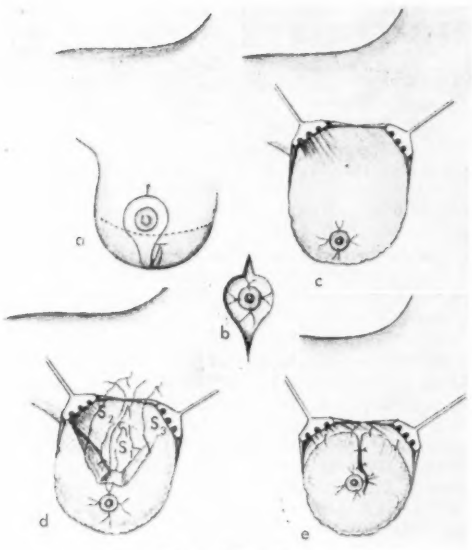
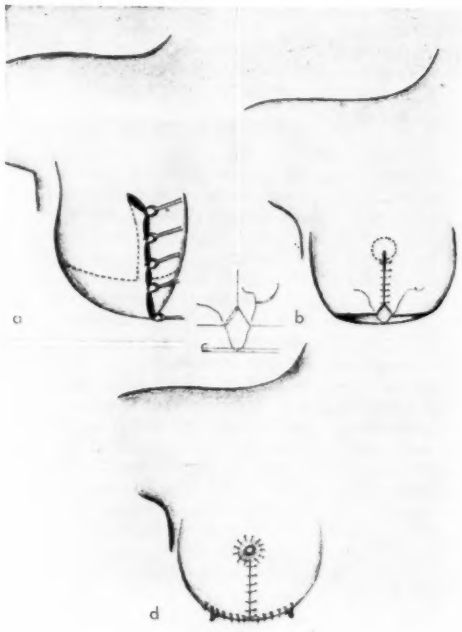


Fig. 1 (Ragnell).



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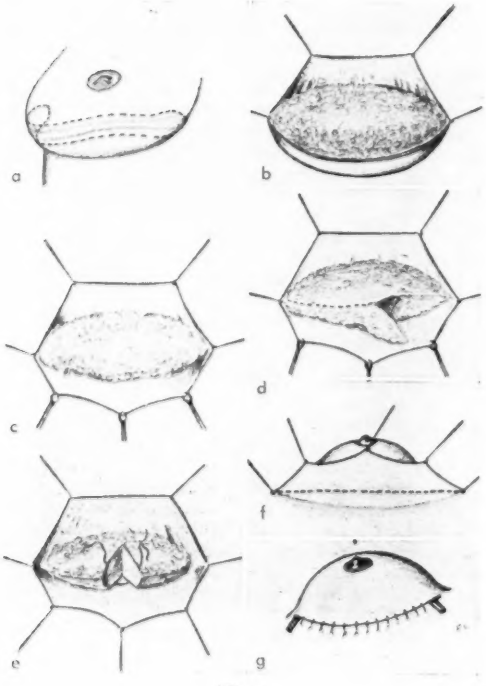

Fig. 2.

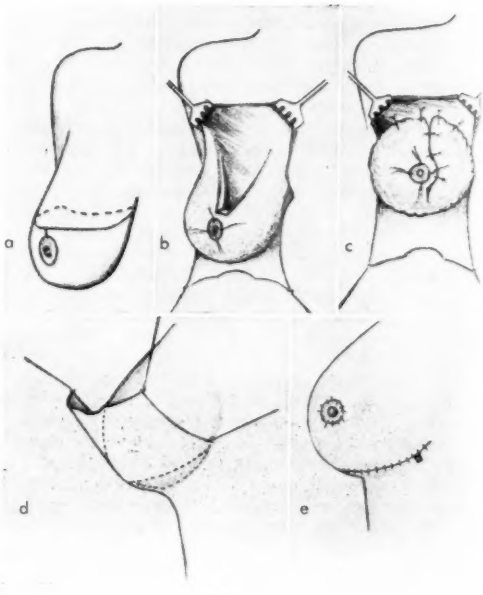

Fig. 4.

LEGENDS

Fig. 1. (Ragnell). Method I (one stage). a, Skin incisions marked. b, Periareolar skin removed; temporary fixation sutures inserted. c, Skin retracted; the gland prior to reduction. d, Sector shaped resection from the gland; fixation sutures with a lifting action inserted: S_1, S_2, S_3. e, Reconstruction of gland.

Fig. 2. Method II (two stages). Stage 2. a, Skin incisions marked. b, Upper skin flap retracted. c, Upper and lower skin flaps retracted. d, Crescent shaped resection of gland. e, Sector shaped resection of gland; one of sutures inserted. f, Skin covering replaced; resection from lower skin flap. g, Final skin suture.

Fig. 3. Method I (one stage). a, Skin covering replaced preparatory to shaping and reduction. b, Skin covering reduced and sutured. c, Detail of suturing. d, Final skin suture.

Fig. 4. Method II (two stages). Stage I. a, Skin incisions marked. b, Skin retracted, sector-shaped resection from gland. c, Reconstruction of gland. d, Skin covering preparatory to reduction of lower skin flap. e, Final skin suture.

In part 3, the operative techniques used by the author, and their evolution from the methods of others are presented. Preoperative and postoperative care are considered. The author uses both a single stage procedure in cases of breasts without enlargement or with only moderate hypertrophy, and a two stage procedure for long and pendulous breasts and those with more marked hypertrophy.

In the final section, the author criticizes his method as to its anatomical and clinical aspects. Tables pertaining to symptoms, weights of resected tissues, diagnosis, complications, etc. are presented, and anatomical and physiological results are tabulated.

This monograph is worthy of study by anyone interested in plastic or reconstructive surgery on the female breast. EARL H. KLABUNDE, M.D.

TRACHEA, LUNGS, AND PLEURA

Cleland, G.: Traumatic Pulmonary Edema Treated with Concentrated Plasma. *Lancet*, Lond., 1946, 2: 667.

Pulmonary edema due to trauma carries a grave prognosis. It was observed frequently in battle casualties, and its causes included blast, petrol explosions, chest wounds, fat embolism, and accidental overtransfusions with either blood or saline solution. In civilian accidents it is observed in burns due to underground explosions, in petrol explosions, in accidental inhalation of noxious gases in industry, and in accidental overtransfusions. Pulmonary edema is characterized by severe respiratory distress and pronounced cyanosis. Large quantities of frothy mucus are thrown up into the trachea and well up through the larynx. According to the degree of consciousness present, attempts are made by the patient to cough up the frothy mucus. Auscultation of the chest detects coarse crepitations which sound very close to the stethoscope. Danger to life lies in drowning from vast quantities of mucus in the alveoli and bronchial tree.

The author states that he has observed on many occasions that concentrated plasma administered intravenously reduces edema in second degree burns, apparently by its direct action in raising the osmotic pressure in the capillaries. If this can be done in traumatic edema in other parts of the body, it should be possible in pulmonary edema due to trauma. The author outlines his method of treatment for pulmonary edema of traumatic origin:

1. Atropine (gr. 1/50) is administered intravenously to diminish bronchial secretion to a minimum as soon as possible.

2. As much of the mucus in the bronchial tree as possible must be removed. This is accomplished by postural drainage, aspiration, and injection of the drugs which tend to produce a temporary return of the cough reflex.

3. Oxygen is given continuously by a method which insures maximal concentration of that gas in the nasopharynx.

4. Concentrated plasma is administered intravenously. Originally, double strength plasma was used; later, triple strength plasma has been used. The plasma is administered at a rate of 80 drops a minute, and little difficulty is experienced in maintaining the flow if slight pressure is used. A dose of 400 c.c. is usually adequate, but occasionally up to 800 c.c. are required.

5. Other fluid intake is regulated to a minimum to obtain the maximal benefit from the increased protein concentration in the circulating blood.

The author gives 5 case reports in which this procedure was used and summarizes his article as follows:

Intravenous administration of concentrated plasma has seemed to be a valuable addition to recognized methods in the treatment of pulmonary edema due to trauma. Illustrative cases are described.

There has been no tendency for the pulmonary edema to recur after this treatment in the types of cases described. Apart from the risk of reactions to the plasma, the method is dangerous only if applied without preliminary venesection in cases of pulmonary edema due to overtransfusion.

PAUL MERRELL, M.D.

Brock, R. C.: Studies in Lung Abscess. *Guy's Hosp. Rep.*, Lond., 1946, 95: 40.

Abscess of the lung due to infection with Friedlaender's bacillus is a rarity; like staphylococcal lung abscesses, it serves as a characteristic example of an abscess due to a specific infection. This is in contrast to the much larger group, in which the primary cause is some form of bronchial embolism. In the case of a Friedlaender's infection, the primary event is a specific pneumonia, and the abscess follows this pneumonia. The condition is indeed "pneumonia with abscess formation." The statement that lung abscess usually follows pneumonia is largely incorrect. In nearly 75 per cent of cases, it is possible to identify the primary cause as other than a primary acute pneumonia.

The acute pneumonia caused by Friedlaender's bacillus is notorious for its gravity and its high mortality. Usually the clinical course is short; none of the earlier reports describes a chronic form of the disease. The scanty literature reveals that 18 cases have been reported in which the ordinary, acute specific pneumonia caused by Friedlaender's bacillus did not end fatally, but broke down to form abscesses, and assumed a chronic suppurative course. The condition in some of the patients resolved with fibrosis; some patients ultimately succumbed.

The bacillus of Friedlaender must always be thought of as the possible causal organism when abscess formation appears in areas of massive "pseudolobar" consolidation in a gravely ill patient. It must also be borne in mind if such a suppurative process becomes chronic, and particularly if the persistence of thin-walled cavities with metastatic lesions elsewhere in the lung simulates chronic pulmonary tuberculosis, but the sputum is consistently negative for tubercle bacilli.

Two additional cases are reported, which brings the total to 20. SAMUEL KAHN, M.D.

Paul, L. W., and Ritchie, G.: Pulmonary Adenomatosis. *Radiology*, 1946, 47: 334.

Pulmonary adenomatosis in man is a rare pulmonary disease characterized by the development of multiple nodular adenomatous tumors or by diffuse hyperplasia of the pulmonary alveolar lining. The disease is bilateral and interferes greatly with the gaseous exchange. Metastases do not occur elsewhere in the body, and patients usually succumb from terminal pneumonia. Pathologists speculate on its close histological resemblance to an infectious disease of the lungs, called "jaagsiekte" in sheep and other animals. This disease is endemic in many areas of the world; it is believed to be of infectious origin and possibly due to a virus. Just what relationship exists between jaagsiekte and pulmonary adenomatosis in man remains to be determined.

Bonne, in 1939, first described this condition in man and called attention to its close resemblance to jaagsiekte in sheep. He suggested calling this condition carcinosis rather than carcinoma. Numerous cases of a similar nature have been recorded in the literature, but they vary chiefly in the fact that metastases have been found either in the bronchial lymph nodes or scattered widespread throughout the body. The disease has been referred to as alveolar cell carcinoma and shows the characteristics of a malignancy. The metastases often influence the clinical symptoms and progress to a considerable degree.

The authors limit their discussion to cases in which metastases do not occur, and which resemble more closely Bonne's original description.

Investigations to determine the infectiousness and the presence of a virus in pulmonary adenomatosis are few, and thus far have been fruitless.

The pathological lesion consists typically of scattered nodules of consolidation on the cut surfaces of the lungs. These are usually mistaken for patches of gray pneumonia until microscopically they are identified as localized occurrences of abnormal lining in the alveoli. The lining is made up of either low or moderately high cuboidal epithelium, the cells of which tend to be slightly pear shaped and form papillary projections into the alveolar spaces. These cells are believed by some to have arisen from alveolar covering cells, although there is some evidence that they come from bronchial epithelium. The alveolar walls in these nodules are thickened and edematous, with increased connective tissue.

The authors present 5 cases of pulmonary adenomatosis, illustrated by x-rays and photomicrographs. A study of the histology in these cases seems to show (1) that the abnormal epithelium of adenomatosis is derived, in some cases at least, from bronchial epithelium, and (2) that in certain cases adenomatosis constitutes a transitional form between normal lung and carcinoma and must be regarded as a potentially precancerous lesion.

The onset of pulmonary adenomatosis is usually insidious, although in several of the authors' cases it was accompanied by symptoms of an acute respiratory infection. Dyspnea and cough were the two most common symptoms. The dyspnea is due to replacement of the alveolar cell lining with abnormal cells, which interferes with gaseous exchange. Tenacious secretions in the alveoli and bronchi also cause dyspnea. The dyspnea may be far out of proportion to the extent of the pulmonary involvement that can be demonstrated roentgenographically.

The cough is usually productive of thin, watery, frothy mucoid sputum. The sputum may be abundant early or late in the disease. Hemoptysis does not occur, and blood-streaked sputum is usually seen only in a terminal phase. This watery sputum can be accounted for by the tendency of the abnormal cells to produce mucus.

The remaining symptoms of weight and strength loss, fever, and anorexia are not of diagnostic importance. In the majority of cases, the condition occurs at the usual age period for carcinoma. The duration of the disease is for months or years; 4 of the authors' patients survived 2 years, 7 years, 4 months, and 2 years, respectively.

A review of roentgenograms shows 2 main types of lesion, neither of which is in any way characteristic. One group of lesions is manifested by an area or areas of homogenous density resembling pneumonic consolidation. They are often bilateral and extensive. Atelectasis is not a prominent feature. The roentgen diagnosis is usually pneumonia or bronchiogenic carcinoma. A second form of the disease is manifested by nodular or patchy infiltrative shadows, often widely disseminated throughout both lungs, and likely to be confused with carcinomatous metastases, sarcoid, Hodgkin's disease, silicosis, or tuberculosis. Since the shadows produced can be caused by a number of other conditions, the outlook for eventually establishing definite roentgen diagnostic criteria seems remote.

The diagnosis is purely of academic interest, since all cases of the disease have been fatal. The possibility of lobectomy or pneumonectomy has been suggested if the disease can be recognized early enough, before it has spread widely.

It is hoped that with the accumulation of additional cases in the future, a better understanding of the clinical and roentgen aspects of the disease may be obtained. ROBERT R. BIGELOW, M.D.

Mustakallio, S.: The Result of Roentgen Therapy in Histologically Verified Cases of Pulmonary Cancer. *Ann. med. int. fenn.*, 1946, 35: 109.

This investigation is based on 51 histologically verified cases of pulmonary cancer. The patients included 47 men and 4 women. The cases were divided into two groups according to treatment. The first included those who were given radical roentgen therapy (over 10,000 r. on the skin), and the second, those who were not treated or who were treated insufficiently (under 10,000 r. on the skin). The patients in the former group have lived on an average of 1 year, 2 months, and 11 days after the beginning of the treatment and 1 year and 9 months after the onset of symptoms. Two patients are still alive and well, one after 6 years and 10 months, and the other after 3 years and 7 months following treatment. Metastases were found in the clavicular region and in the neck of the former patient. These metastases were treated and cured. This shows that in some cases cure can be obtained with roentgen rays but not with surgical treatment.

In the group of untreated patients, the average survival time after diagnosis is 3 months and 5 days, and from onset of the symptoms, 5 months and 9 days. The inflammatory processes around the carcinomas in the lungs have a disturbing effect on the roentgen treatment. Chiefly because of that fact, only 21 of 51 patients have tolerated the radical roentgen therapy.

Roentgen treatment must be tried in all cases of pulmonary cancer if the general condition of the patient permits the trial of this very often strenuous therapy. If the patient tolerates this treatment, it must be continued until the tumor dosage of 6,000 r. is reached. JOHN E. KIRKPATRICK, M.D.

HEART AND PERICARDIUM

Welin, S., Hamberger, C. A., and Crafoord, C.: Surgically Removed Foreign Body Embolus in the Pulmonary Artery. *J. Thorac. Surg.*, 1946, 15: 302.

In this case reported by the authors, a metallic object 1 cm. in length, over 1 mm. in thickness, and from 7 to 8 mm. in breadth, had entered the femoral vein and had been thrown by the blood stream into the pulmonary artery.

There is no mention in the medical literature of a case in which a foreign body had entered a vessel so far toward the periphery as in this instance. From a diagnostic viewpoint this case was of the greatest interest. Only by the combined use of the x-rays and bronchoscopy could the exact diagnosis be made.

So far as the authors were aware, this was the first case in which the diagnosis of foreign body embolus in the pulmonary artery had been made prior to operation, and in which the foreign body had afterward been extracted by thoracotomy plus arteriotomy followed by vascular suture.

The case report and operative procedure are given in detail. JOHN J. MALONEY, M.D.

ESOPHAGUS AND MEDIASTINUM

Morton, D. R., and Brunschwig, A.: Peptic Ulcer of the Esophagus. Report of a Patient with 10 Year Follow-Up. *Gastroenterology*, 1946, 7: 314.

The purpose of this report is to record the history of a patient seen in 1935 with a lesion which was at first thought to be malignant but which eventually proved to be a benign ulcer. The patient has subsisted principally by gastrostomy feedings until the

Fig. 1. (Morton and Brunschwig) Roentgenogram taken in 1935 showing constriction and deformity of lower thoracic esophagus which gave clinical impression of carcinoma.

Fig. 2. Photomicrograph (×50) of biopsy of esophageal ulceration secured in 1935; typical appearance of peptic ulceration.

present time (1945), a period of 10 years. When first observed in 1935, the question of resection was not seriously considered inasmuch as the technique for such a procedure had not been well defined, and few attempts at such excision had been made. The patient, a 65 year old widow, entered the Medical Service of Billings Hospital for the first time on June 26, 1935 with the following story:

One year prior to admission she noted burning epigastric pain an hour postprandially. Her local physician made a diagnosis of duodenal ulcer without the aid of x-rays or gastric analysis. She was treated with powders and a bland diet and obtained complete relief. There was a weight gain of 23 pounds on this regime.

Two months prior to admission she began to vomit recently ingested food. At first this occurred 3 or 4 times a week. The vomitus was not bitter and contained no evidence of blood. The vomiting progressively became more severe. It occurred after every meal and began to be associated with sharp substernal pain which frequently radiated through to the back at a point between the shoulder blades. This pain was also noted upon swallowing food. The patient stated, "it felt as though there were an obstruction." At first, solids could be ingested, and then only fluids, and finally, during the 3 weeks before entry nothing could be retained. There was a weight loss of 45 pounds.

On physical examination she appeared emaciated and dehydrated, and there was obvious evidence of recent weight loss. There were no remarkable findings pertaining to her condition other than changes associated with senility. The abdomen was scaphoid, not tender, and presented no masses. Laboratory data were all within normal limits.

A provisional diagnosis of carcinoma of the terminal esophagus was made. The patient received parenteral fluids, and roentgenographic study revealed that the esophagus was narrowed to approximately 3 or 4 mm. for a distance of 9 or 10 cm. at the level of the seventh thoracic vertebra. The margins of the constricted area were somewhat irregular (Fig. 1A). The mucosal folds were not completely destroyed, and the segment of narrowing tended to change shape. Small peristaltic waves were seen passing through this area. There was no evidence of a "fleck" or protrusion suggestive of ulcer or diverticulum. The mucosal pattern of the stomach appeared normal. It was decided to repeat the procedure described after the patient had inhaled amyl nitrite. Following this, there being no change, the radiologist believed that the stricture was an organic lesion, probably scirrhous carcinoma.

The patient was transferred to the surgical service with a preoperative diagnosis of carcinoma of the terminal esophagus. On July 2, 1935, under local and ethylene anesthesia, a high midline abdominal incision was made. There was no evidence of carcinoma within the abdominal cavity. The gall bladder wall was thick and contained many stones. The operative procedure consisted of a cholecystectomy and a Pezzer catheter gastrostomy (Brunschwig). The postoperative course was uneventful. Within 10 days she was tolerating a full gastrostomy diet, gaining weight, and appearing cheerful.

Esophagoscopy with biopsy was performed on 3 occasions, July 22, 1935, November 12, 1935, and December 16, 1935. All 3 examinations revealed a narrowing to 4 mm. of the midportion of the esophagus. The right lateral wall was pale, flat, and showed an ulceration with well demarcated borders. The surrounding mucosa was red and granular. The granulations bled easily and the lumen was dilated. All esophagoscopic examinations gave the impression of carcinoma, but the 3 biopsies revealed chronic ulceration (Fig. 2). On none of the biopsy specimens was there epithelial lining.

The patient was discharged and followed up in the out patient clinic. Other than having to return every 6 to 8 months for replacement of the Pezzer catheter gastrostomy, which became eroded from the gastric juice, the patient enjoyed excellent health. She gained 30 pounds in weight on the gastrostomy diet, and gradually was able to take a pint of milk and a soft boiled egg by mouth each

day. However, the main part of her nourishment was taken through the gastrostomy catheter. Roentgenographic study was repeated on November 16, 1937, and the stricture was found to occlude the esophageal lumen almost completely.

In 1939 she moved away from the vicinity of Chicago and was not heard from until she was readmitted to Billings Hospital on November 29, 1945. She was now 75 years of age and had been well until the previous June at which time she developed intermittent attacks of vomiting. The first attack continued for 3 days and the vomitus contained brown digested blood according to her physician. Roentgenological studies performed elsewhere were said to show "advanced carcinoma of the terminal esophagus and the pylorus." She was advised to return to her original physician for treatment. Physical examination revealed an elderly female in comparatively good health. There were no findings of significance other than a slight excoriation of the skin about the gastrostomy tube, which because of erosion was spilling gastric juice about its entrance into the abdomen.

The catheter was replaced under general anesthesia. Repeat roentgenographic studies (Fig. 1B) revealed no change in the esophageal lesion except irregularity of the lumen in the constricted segment; a crater 3 mm. in diameter was found in the duodenal bulb. There was no associated obstruction in this area.

Esophagoscopy revealed that the esophagus was normal to within 2 cm. of the constricted area. The posterior wall at this point was red. Anteriorly there was a "tough rim" (fibrous) which narrowed the lumen and prevented passage of the instrument. The No. 15 and No. 20 bougies were passed, the former without resistance.

She was allowed no feeding by mouth, no phenobarbital, and no tincture of belladonna. Gradually she was placed on milk and cream by gastrostomy catheter and she showed improvement rapidly. She was discharged on December 21, 1945 in good general condition.

The active duodenal ulcer might be associated with the presence of the Pezzer catheter in the stomach for 10 years although this is not certain.

Since resection of the esophagus entails much risk, the diagnosis of carcinoma should be confirmed by biopsy in any questionable case before such a procedure is attempted. The relatively satisfactory course in the case described, even though subsistence by gastrostomy was necessary, supplies information as to the course of the disease in cases of severe "peptic" ulceration of the esophagus. Possibly more efficient medical management might have alleviated the degree of stenosis that occurred.

JOHN J. MALONEY, M.D.

Lewis, I.: The Surgical Treatment of Carcinoma of the Esophagus. *Brit. J. Surg.*, 1946, 34: 18.

The esophagus is a difficult surgical field for three reasons—its inaccessibility, its lack of a serous coat and its enclosure in structures in which infection is especially dangerous and rapid. In the case of carcinoma of this viscus, surgery is still more difficult for several reasons. It involves an extensive resection in a part of the alimentary canal which not only has no serous covering but also has no slack. It threatens the surgeon with having both pleurae open during the operation. Because of the loosely knit muscle, anastomosis of its walls has with some reason been described as "suturing the unsuturable."

It seems that in radiation therapy of the esophagus for carcinoma the upper third of this organ is occasionally cured; in the middle third the growths are frequently of a radiosensitive type, but they cannot be effectively treated because of their depth, while in the lower third the adenocarcinomas are both relatively inaccessible and relatively insensitive. The author believes that direct irradiation of an inoperable growth through the operative wound, combined with lateral anastomosis (esophagogastrostomy), is a treatment well worth trying.

The aims of radical cancer surgery are: (1) to cure the disease while (2) rendering the patient's life useful and enjoyable, or at least bearable.

Judged by this criteria, the present position with reference to carcinoma of the lower part is very satisfactory. Not only does the resection with esophagogastrostomy satisfy the postulates of Halstead for the removal of cancer, but it also produces the best possible alleviation of symptoms. For growths of the lower part of the esophagus, the left thorax is freely opened through the bed of the eighth rib. The phrenic nerve is paralyzed. The esophagus is mobilized and the diaphragm freely slit from the hiatus outward. The upper half of the stomach is mobilized and brought up into the pleural cavity.

The following are essential:

1. Adequate resection en bloc.
2. Removal of all tension from the suture line.
3. Avoidance of the least soiling.
4. An anastomosis which is end-to-side, two-layered, precisely stitched with interrupted sutures.
5. Just as the sheet anchor in abdominal anastomoses is the serous coat, in the esophageal anastomoses, it is the mucosa. This is thick and comparatively strong.
6. Water-sealed drainage and early expansion of the lung.

For growths of the midesophagus also, most surgeons have used the left transpleural approach. However, the advantages of the right transpleural approach are:

1. A far better accessibility of the upper two-thirds of the thoracic esophagus.
2. Only the vena azygos major has to be divided to lay bare its whole course.
3. The aortic arch (and to an extent, the descending aorta), instead of being an obstacle, becomes a safety barrier between the surgeon and the other pleural cavity. Instead of separating the growth bluntly and blindly from behind the arch, it can be dissected under full vision.

The side chosen for the operation should be that giving the better exposure. Therefore, to operate on the midesophagus through the left pleura is as unanatomical as it would be to operate on the lower end through the right pleura. By adoption of the method to be described, the question of lymphatic spread in no way affects this general proposition.

Stage 1. An upper left paramedian laparotomy is done. The abdomen is carefully explored. If there are no metastases, the greater curvature of the stomach is freed in its upper half. The vasa brevia, left gastroepiploic artery, and the omentum are divided well away from the stomach to leave a vascular arch attached to the greater curve. The gastrohepatic omentum is then divided, again well away from the lesser curve, and the left gastric artery is tied and divided near its origin. To reduce inflammatory reaction and adhesions, fine silk should be used throughout and the most careful hemostasis secured. Finally, a loop of gut about a foot down the jejunum is chosen and a size 10 catheter inserted by Witzel's method. This is brought out, surrounded by omentum, through the lower end of the wound. If metastases are present, all that is done is a Janeway gastrostomy.

For 10 or 15 days after the first stage, every effort is made to improve the patient's nutrition by a high carbohydrate, high protein diet with extra vitamins. The jejunostomy makes this possible.

Stage 2. With the patient in the left lateral position, and a sandbag under the chest, the whole of the right sixth rib from the neck to its cartilage is removed, and the chest entered through its bed. If after careful examination the growth seems removable, the lung is packed forward and the vena azygos major divided between ligatures. The mediastinal pleura is then incised and just above and below the growth, pieces of tape are passed around the gullet to be used as guide ropes. The involved segment, together with any glands, is then slowly dissected free. Care must be taken to avoid opening the left pleura—a serious complication. There is no need to paralyze the phrenic nerve. The lower end of the esophagus is gradually freed by retracting the diaphragm, dividing the branches of the vagi, and keeping it on a stretch with spongeholders. The part in the esophageal hiatus is then freed with the index finger. A specially devised sickle-shaped retractor is now insinuated into the hiatus. This instrument not only retracts and stretches the hiatus with its tapering end, but holds the diaphragm and underlying liver out of the way. As soon as the cardia is drawn up through the hiatus, the peritoneum is opened and then severed all around the circumference. By steady drawing on the cardia, the fundus and eventually the body of the stomach are brought up into the pleural cavity. Adhesions of varying strength will have formed in the interval since the first operation; these are separated. When the stomach is sufficiently mobilized so that the fundus reaches well above the growth, the esophagus with a wedge of cardia is severed and the gap sutured and invaginated. If any enlarged glands have now become evident along the upper part of the lesser omentum, it is probably safe to extend the excision to include part of the lesser curvature and still leave the fundus viable as the vascularity of the stomach is remarkable. The next step of the operation is to prepare the gastric bed on which the esophagus will lie. The upper end of the stomach is fixed in the angle between the vertebral bodies and mediastinum. Five or 6 interrupted silk sutures are placed along each edge, to fix the stomach posteriorly on the anterior spinal ligaments and anteriorly to the anterior cut edge of the mediastinal pleura. The esophagus is then laid upon the stomach and the posterior layer of interrupted sutures is put in before cutting of the growth. A transverse incision is made in the stomach. Three points are mentioned: (a) the incision should be on the short side as it can easily be lengthened, but once it is too long, it will make for a faulty joint; (b) any bleeding point should be tied before proceeding as the time spent will be amply repaid by a clean field and accurate suturing; and (c) a small sucker with a hooked point should be kept just inside of the stomach incision. The through-and-through layer should be sutured with a fine needle and fine silk, the close interrupted sutures each carefully including the esophageal mucosa. All knots are placed on the inside. The anterior seromuscular sutures are then placed. Finally, if it can be done easily, the stomach edges or omental fringes are folded over in front of the anastomosis and sutured. The enlarged hiatus does not need stitching up; it is only about the circumference of a wrist; 3 or 4 sutures are, however, placed between the stomach and its rim to prevent the small gut from passing through. Sixty thousand units of penicillin are sprinkled around the anastomosis. A No. 14 catheter is placed alongside the anastomosis, with a second hole cut lower down to lie just inside the pleura. This is brought out through the ninth intercostal space laterally, to drain under water.

The chest wall is sutured in layers.

During the stitching up the anesthetist endeavors to get the lung well expanded. Any air left is drawn out forthwith by suction to the catheter. Blood transfusion is given to the patient throughout the operation.

If there is an appreciable amount of bronchial secretion, a careful bronchoscopic cleansing is done before the patient leaves the table.

Postoperative care consisted of blood transfusions, nourishment via the jejunostomy tube, oxygen, daily stomach washings, and frequent roentgenograms of chest and stomach with barium. The blood protein should be estimated on the third day. Concentrated serum is given intravenously for edema of the bases of the lungs. Culture is made from the intercostal catheter after 2 days. The patient is out of bed and on a full soft diet in about 3 weeks.

The author reports 7 cases of esophagectomy with 5 recoveries.

The practical criterion is that the degree of malignancy, to the patient, is the length of time the disease takes to kill him; to the pathologist, it is an opinion based on the postmortem findings and the appearance of the cells. For the surgeon, it may be defined as the liability to recurrence after apparently adequate removal. LEE PULLEN, M.D.

MISCELLANEOUS

Dickson, J. A., Clagett, O. T., and McDonald, J. R.: Intrathoracic Gastric Cyst. *J. Thorac. Surg.*, 1946, 15: 318.

A white girl, 10 years of age, had a long history of repeated "pneumonic" attacks. Physical examination revealed diminished resonance, tubular breathing, and increased conduction of voice sounds on the left side of the thorax. A roentgenogram showed massive atelectasis involving at least the lower lobe of the left lung and possibly part of the upper lobe. On bronchoscopy, a great deal of purulent secretion was aspirated from the left side, but no evidence of a foreign body was found. However, there was a definite narrowing, especially of the posterior branch of the left lower lobe bronchus. Studies in which radiopaque oil was used confirmed this.

At operation a primary left posterolateral incision was made and a long segment of the seventh rib was resected, and the pleura opened. The entire surface of the left lung was densely adherent to the thoracic wall. A line of cleavage was established between the visceral and parietal pleuras and a good fissure was found between the upper and lower lobes. It was possible to carry out hilar resection with individual ligation of the hilar structures. A large cystic mass which extended down into the diaphragm posteriorly was found in the medial portion of the lower left side of the thorax. The esophagus lying anterior to the cystic mass was identified. The cystic mass was very adherent to the mesial and undersurface of the lung and was first thought to be a cyst of the lung. It proved to be a congenital mediastinal gastric cyst which had become infected and established bronchial communication. Chronic suppurative disease was present in the bronchus of the lower lobe. Dissection was carried out down through the diaphragm with some difficulty. The entire cyst was removed. Temporary closed intercostal drainage was instituted and bronchoscopy was performed postoperatively.

Several unusual features about this case of intrathoracic gastric cyst are worthy of consideration. The first of these was its partial extension below the diaphragm. Reports of other gastric cysts indicate that they have been attached to the diaphragm or embedded in it, but the authors believe that none of the intrathoracic cysts has extended below the diaphragm. In the author's case, this extension was of considerable surgical importance because removal of it necessitated repair of the diaphragm following removal of the cyst.

The associated bronchiectasis in the left lower lobe was a second unusual feature. The cyst had apparently established bronchial communication. It is impossible to determine in this case what part peptic ulceration played in the establishment of such a bronchial communication. Unfortunately, studies were not carried out to determine whether the contents of the cyst contained enzymes or acid. Because of the types of mucosal linings present, including the parietal cells in sufficient quantity, and the thick, mucoid character of the contents of the cyst, it does not seem unreasonable to assume that such a cyst was producing acid and peptic enzymes.

A third feature was that the cyst contained the esophageal, as well as gastric, type of mucosa, as has been the situation in a few of the reported cases. A large number of parietal cells were found in the gastric type of mucosa. The wall of the cyst was composed of three distinct layers.

There was no intimate attachment of the cyst wall to the esophagus, nor did the cyst and the esophagus have a common musculature. The latter situation was important because it permitted primary removal of the cyst in one stage. This is not feasible in many cases because of the intimate attachment to the esophagus. The firm attachment of the lower lobe of the left lung to the lateral portion of the cyst wall did increase the difficulty of resection. As far as can be determined, this is the first case in which an intrathoracic gastric cyst was associated with bronchiectasis, had a portion of its wall extending below the diaphragm, and was treated successfully by removal of the cyst and lower lobe of the left lung in one stage.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Brandon, W. J. M.: Inguinal Hernia: The Unpredictable Result. *Brit. J. Surg.*, 1946, 34: 13.

It is becoming increasingly evident that the inguinal muscular mechanism is now regarded as the key to the problem of oblique inguinal hernia. We must, therefore, obtain an accurate conception of the anatomy and function of this mechanism before turning to the problem itself.

It is not the presence of a patent process of peritoneum that accounts for the frequency of hernia in man, but a weakness in the groin which has resulted from his upright posture. The most potent factor in the production of an oblique hernia, certainly of the acquired type, is a prolapse of the cord. This prolapse may be due to a defect primarily affecting the valvular mechanism or may be secondary to an ineffective cremasteric recoil.

Simple shutter action provides complete protection to the posterior wall against the outward thrust of intra-abdominal pressure. When it fails, two types of direct hernia occur: a saucer-shaped bulge due to the stretching of the entire posterior wall, or a funicular sac which appears to the lateral side of the insertion of the conjoined tendon and is associated with a localized congenital weakness or defect in the transversalis fascia.

Any breakdown or malfunction of the inguinal mechanism leads ultimately to a prolapse of the cord. If a preformed sac is present, it is bound to prolapse with the cord so that its well defined anatomical neck comes to be distal to the internal ring. The full force of the intra-abdominal pressure through the incompetent valve mechanism against the anatomical neck sooner or later dilates the new neck of the sac and results in a congenital hernia.

In an acquired hernia, once the posterior wall has been torn, the fundus of the sac comes to lie outside the infundibuliform fascia, and, no longer meeting with any resistance, is able to accompany the cord as an oblique sac with all the known characteristics of an acquired hernia. Frequently, the sac fails to disrupt the infundibuliform fascia and, therefore, lies within it, but in all other respects it remains characteristic of the type.

The main point at issue in considering the repair of an oblique inguinal hernia is how much reliance can be placed on a repaired inguinal mechanism. The presence of a sac is an essential component of hernia in childhood; a second factor is the undeveloped state of the inguinal canal. If the surgeon attends to the first, nature looks after the second, and success is assured. The author makes the following comment:

"When we consider the multiplicity of repairs, including simple herniotomy, we are struck by the fact that the only repair which provides a certain cure in adult life is complete closure of the inguinal canal after removal of the cord and testis. It was on this fact that I based my solution, for every repair (with the exception of Schmieden's operation and my own modification of Ogilvie's method of mobilizing the cord in the lateral direction to allow complete closure of the inguinal canal) preserves the inguinal mechanism in some degree; and it is the preservation of this mechanism either wholly or in part that has made the repair of any given oblique inguinal hernia an unpredictable result." LEE PULLEN, M.D.

Dantlo, R.: Transplantation of Dermis in the Treatment of Eventrations (Transplantation de derme pour la cure des éventrations). *Presse méd.*, 1946, 54: 680.

Simple closure of eventrations by suturing the various layers of the abdominal wall over them is often followed by recurrence. A method which prevents such recurrence is the suture of dermis over the opening. The dermis becomes transformed into true tendon tissue, as shown by experiments on dogs. The stimulation of the graft is not only hormonal but functional. The stimulus is furnished by the muscle tonus of the tissue into which the dermis is grafted.

Before transplantation, the epidermis must be removed from the dermis by curettage or with a Thiersch knife. The latter method is probably preferable as infection has never been seen in such cases. If there is enough excess skin above the eventration it is removed and used for the transplant. Skin from the thigh may be used. The grafted dermis must be stretched tightly like a drumhead and this tension must be kept up during healing.

The only contraindication is an enormous hernia lying outside of the abdomen, which would require so much force to replace it that failure of the circulation would be brought about. In large eventrations with plenty of skin above them a double-T incision may be made to produce two flaps; one of these is freed from its lateral connections with the abdominal wall, but its connection with the subcutaneous tissue is left. This flap is then sutured to the aponeurosis and the other is turned over it like a double breasted coat. This double covering is not ordinarily necessary, however, as a single layer resists the pressure of the abdominal contents.

This method should become the classical one for the treatment of eventrations and large hernias. The operation is illustrated. AUDREY G. MORGAN, M.D.

GASTROINTESTINAL TRACT

Renshaw, R. J. F., Kiskadden, R. M., and Templeton, F. E.: Gastrocolic Fistula; A Clinical and Experimental Study. *Gastroenterology*, 1946, 7: 511.

When gastrocolic fistula complicates the treatment of peptic ulcer, a devastating syndrome results, which is characterized chiefly by diarrhea,

steatorrhea, weight loss, anemia, and malnutrition. Previous reports in the literature indicate that these symptoms develop because food is shunted from the stomach through the fistula into the colon. The authors' experience with dogs and humans indicates that a shunt is not the major factor.

Gastrocolic or enterocolic anastomoses were produced in 7 dogs. Roentgenological studies revealed that all or a major part of the barium meal passed from the stomach into the upper small intestine in all dogs, although in 4 dogs a small or minor portion of the barium passed into the colon through the fistula. Similar studies in 10 human patients with gastrocolic, gastrojejunocolic, or enterocolic fistula revealed that the barium meal was passed from the stomach into the upper small intestine. In one dog the barium meal was observed to pass from the stomach into the small intestine, then into the colon; finally, the barium meal regurgitated through the fistula back into the stomach, from which it passed again into the upper small intestine. This same process was observed in one human patient. On postmortem examination of the dogs, the small intestine, especially the upper third, revealed a striking subacute to chronic type of inflammatory infiltration limited almost exclusively to the mucosa of the papillae.

The development of anemia follows a definite pattern, although the authors admit that their studies are inadequate to describe this pattern in detail. The first change is to hypochromic microcytic anemia, and if the animal survives long enough the anemia tends to become macrocytic hyperchromic.

It is suggested that the deranged digestive and absorptive functions of the small intestine may cause the clinical syndrome ascribed to gastrocolic fistula. Derangement of function of the small intestine is probably the result of damage to the intestinal mucosa caused by the passage of colonic contents through the small intestine. HAROLD LAUFMAN, M.D.

Kristenson, A.: The Pathogenesis of Ulcer (Zur kenntnis der ulcuspathogenese). *Acta. med. scand.*, 1946, Supp. 170, p. 31.

Since Virchow first assumed a vascular genesis for peptic ulcer, many attempts have been made to prove that this condition is the result of a local disturbance in the circulation. The results hitherto have been contradictory.

The author points out that the chief source of blood to the first portion of the duodenum and the lesser curvature side of the pyloric antrum is the right gastric artery. This vessel is small and runs in the opposite direction to the hepatic artery, the flow of which it originates. The small opening of the gastric branch is often further narrowed by changes in the media or the intima of the hepatic artery at the site of origin of the former. These arterial lesions may be the result of changes in the position of the pylorus and proximal duodenum as the patient goes from a prone to a standing position. The upright position would seem to diminish the circulation through the right gastric artery.

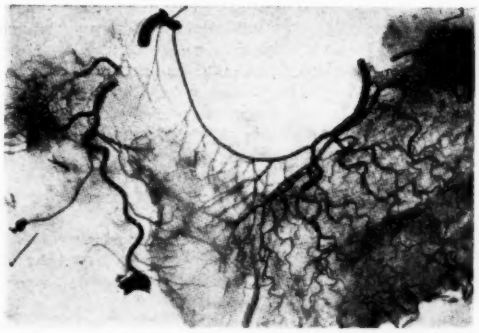

Fig. 1. (Kristenson) Roentgen picture of the stomach injected with contrast medium. Note the poor circulation to the pyloric region.

Injection preparations were made of the stomach and duodenum. These were x-rayed and showed that the circulation to the pyloric antrum and first portion of the duodenum is decidedly less abundant than to the rest of the stomach and intestine. This poor circulation is further embarrassed in the upright position, especially in individuals with marked gastroptosis.

The author concludes with his findings in regard to therapy. Small feedings are preferable to large ones since the former are less likely to disturb the stomach and duodenum, hence less harmful to the circulation around the pylorus. Rest in a horizontal position is advised after each meal. Finally, it is suggested that ulcer is the result of the upright position of the human race.

THEODORE B. MASSELL, M.D.

Wilkinson, S. A., and Tracey, M. L.: The History of Hemorrhage in Peptic Ulcer. *Gastroenterology*, 1946, 7: 450.

The mortality and significance of a first hemorrhage and of later hemorrhages vary widely in published reports.

This study concerns 140 proved cases of peptic ulcer admitted to the clinic, which necessarily had a selective effect upon the series. Of the patients, 125 were males; the average age of the patients was 41.3 years, and the average follow-up was 4.3 years. The over-all mortality was 3.5 per cent (5 deaths). Of the 140 cases only 2 were operated upon without previous medical management and 14 were operated upon after medical management prior to admission. One hundred and twenty-four had medical management at the clinic and 41 of these, had eventual surgery.

There were 70 cases in which hemorrhage was the first symptom of the ulcer and there was only 1 death (1.4%) from the first hemorrhage. Twenty-nine of these patients were more than 45 years of age at the time of their first hemorrhage.

The results of medical treatment were best in the 66 patients with only 1 hemorrhage prior to ad-

mission. Sixty-four of these were treated medically and 78 per cent responded satisfactorily. In this group there was a total recurrence of 25 per cent. Surgery was necessary in 11 cases (17%).

Seventy-four patients had more than 1 hemorrhage prior to admission. Seventy-three were treated medically and 23 per cent responded satisfactorily. Operation was necessary in the cases of 45 patients (61%), and of these patients, one-third had recurrent hemorrhages subsequent to radical operation.

Of the 140 cases, 41 were subjected to subtotal gastrectomy and recurrent hemorrhage appeared in 24%. Of 124 receiving medical treatment, 30 per cent had subsequent hemorrhage.

In this series the first hemorrhage was not more serious than the later ones, and medical management offers a good chance of preventing further hemorrhage.

Patients with multiple hemorrhage do not respond well to any form of medical management, and even radical surgery is not very satisfactory.

FREDERICK C. HOEBEL, M.D.

Tuovinen, P. I.: On the Relation Between Appendical Carcinoid and Appendicitis. *Ann. chir. gyn. fenn.*, 1946, 35: 169.

Carcinoid occurs in the stomach and gastrointestinal tract, preferably in the appendix. It is closely related to true carcinoma, 20 per cent of the cases showing invasion in the neighboring tissues and metastases in the mesenteric lymph nodes and in the liver. Clinically and histologically, however, the disease presents many features of appendicitis; tumor cells are mixed with inflammatory cells (polymorphonuclears, plasma cells, and lymphocytes). The growth originates in the deeper epithelium cells of the crypts.

The author discusses 3 cases of carcinoid which showed the clinical picture of acute appendicitis. He believes that carcinoid may sometimes be an etiological factor of acute appendicitis.

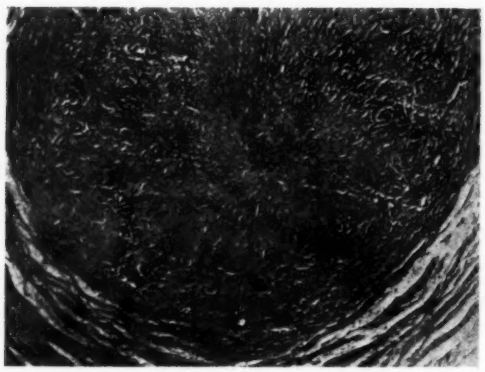

Fig. 1. (Tuovinen) The tumor fills the appendical lumen. Strong proliferation of the connective tissue (x38).

WERNER M. SOLMITZ, M.D.

Scott, W. J. M., and Serenati, Q. J.: Megacolon; Mechanisms and Choice of Treatment. *Surgery*, 1946, 20: 603.

Among the last 250,000 admissions to the Strong Memorial Hospital, Rochester, New York, the authors found 31 cases of megacolon. Because so few cases are seen, there exists in the literature a conflict of ideas about both the etiology and the method of treating the condition. It is believed by the authors that megacolon is a syndrome rather than a disease entity, and that at least 4 different causative mechanisms can be delineated. These are: (a) organic obstruction of congenital origin; (b) neurogenic dysfunction; (c) functional obstruction from extreme redundancy (dolichocolon); and (d) metabolic factors extrinsic to the colon (hypothyroidism, avitaminosis, malnutrition, etc.).

When a patient with megacolon appears for treatment, the following plan of combined diagnostic classification and clinical management is followed:

1. Examination is carried out to exclude organic obstruction of congenital origin. A tremendous dilatation of the colon may, in the presence of normal innervation, musculature, and mucosa, be associated with congenital anomalies in the development or fusion of the proctodeum, which causes a high grade but incomplete obstruction of the lower large bowel. After several years of such obstruction, secondary changes due to dilatation, erosion, and fibrosis may supervene and affect bowel function. It is surprising how such a bowel will retain good emptying power.

2. Factors depressing the metabolic effectiveness of the smooth muscle of the colon are searched for and treated, if found. The authors are unable to state whether such cases can be considered as definite clinical entities.

3. These two causes of disturbance in the emptying of the colon account for only a small minority of the cases. The remainder are then classified as idiopathic megacolon and the patients are put on a medical régime consisting of repeated colonic irrigation, mineral oil, occasional very mild cathartics, vitamin supplements, low roughage diet, and parasympathomimetic drugs. This regimen usually produces some improvement in symptoms which may be sufficient to warrant its continuation as the only form of therapy.

4. If conservative treatment fails to relieve symptoms after a thorough trial, then one of 2 courses is taken: (a) the use of a spinal anesthetic motor test (anesthesia, at least to the costal margin, has to be achieved if the test is to be considered adequate) in cases in which the x-ray evidence is not strongly suggestive of dolichocolon; if, within a few minutes after induction of the anesthetic, the colon vigorously expels most of its contents, which the patient was unable to do voluntarily; the megacolon then is considered to be due to neurogenic dysfunction; (b) im-

mediate exploration and resection of the colon in cases in which the x-ray evidence of a functional obstruction from redundancy (dolichocolon) is convincing.

5. When satisfactory spinal anesthesia is ineffective, then the case is classified as dolichocolon, and resection is carried out as under (b), even though the evidence from the routine barium enema may not be sufficiently clear cut to make the differentiation between neurogenic and dolichocolon types. In the cases of the latter type, it was found that the fundamental mechanism in production of the megacolon was a functional obstruction apparently due to an abnormal increase in the length of the sigmoid. When this abnormally long loop is filled, it causes a kinking just proximal to its fixed point, namely, just above the rectosigmoid.

6. When spinal anesthesia is effective, then the previous conservative régime is continued for at least 3 months more, and may be repeated if gradual improvement in symptoms does not appear.

7. Lumbar sympathectomy is advised only for the small number of patients who respond dramatically to spinal anesthesia, but who fail to obtain relief of symptoms after one or more such inductions.

8. The authors' experience has recently led them to advise early operation in certain young children in whom a marked obstipation has been present since birth, and whose barium enema shows extreme redundancy of the colon with kinking just proximal to the rectosigmoid. In these cases it has been found that conservative measures and parasympathomimetic drugs are usually ineffective. In such instances, when, in addition to the previously mentioned findings, haustral markings are absent in the left colon, resection of the redundant colon has been combined with left lumbar sympathectomy without a spinal anesthetic motor test being carried out. Whether this combination offers more than resection alone is not yet proved.

9. In any case, when resection of the colon is carried out for dolichocolon, utmost care must be taken to prevent the subsequent development of any obstructive sequelae. It is believed that a long side-to-side anastomosis placed between the taeniae is the preferable type of reconstruction under the circumstances although, ordinarily, the authors choose an end-to-end anastomosis, usually of the aseptic type, for most resections of the colon.

Included in the discussion are illustrative cases and reproductions of roentgenograms.

EUGENE J. AUDI, M.D.

Herrmann, L. G.: The Management of Megacolon (Hirschsprung's Disease). *Surg. Clin. N. America*, 1946, 26: 1170.

Before discussing the treatment of megacolon, the author briefly reviews certain theories concerning the genesis of megacolon, pathologicophysiological considerations, the diagnosis of the condition, and the pathological changes in megacolon. Under the last heading are included statistics which indicate that about 33 per cent of the patients have involvement of the sigmoid colon alone. Figures compiled by the Mayo clinic reveal that 42.3 per cent of cases seen at the Clinic have had involvement of the rectum, and 11.5 per cent have had involvement of the cecum. The parts of the colon proximal to the hepatic flexure were involved in 26.9 per cent of their cases. In all of the author's cases there was involvement of the sigmoid colon and of the portions of the large bowel immediately adjacent and proximal to the sigmoid colon.

Examination of these patients on admission often reveals that the distal part of the colon is packed with feces causing subacute colonic obstruction with marked gaseous distention of the entire colon. If, at this time, rectal examination reveals the presence of congenital strictures of the rectum, they must be treated by regular dilatation with the finger, or with soft rubber bougies, before any other form of treatment is instituted. Adolescent children and young adults have reported weeks of relief following a single manual dilatation. Overstretching of the sphincter muscles usually leads to a short period of fecal incontinence. The age of the patient and the extent of involvement of the colon usually serve as valuable guides for therapy, since young children should always have the benefit of prolonged medical treatment and those children over 5 years of age with extensive involvement of the colon should have the benefit of properly planned and executed surgery. In the medical management of megacolon, acetylbetamethylcholine (mecholyl) has been used. Experience has shown that the optimum times for its administration are (1) 30 to 60 minutes after breakfast; (2) in the midafternoon, or (3) at any juncture to parallel and enhance an observed daily intestinal rhythm. Nausea, vomiting, and abdominal pain result if the drug is given before breakfast. It should be administered for a 5 to 10 day period if it is expected to correct an autonomic imbalance, with the establishment of new reflexes which are necessary to regulate intestinal function. An average initial dose of acetylbetamethylcholine bromide for patients with megacolon is 0.1 gm., increased, if necessary, to 0.2 gm. within 2 to 3 days. Then, after several more days with this daily dose, if bowel function is still not well established, an additional dose of 0.1 or 0.2 gm. in midafternoon may be prescribed. As the drug becomes effective in bringing about more normal function of the bowel, daily enemas are discontinued but the oral administration of mineral oil is continued because of its lubricating action in the colon; 0.2 gm., given each morning and in midafternoon, is sometimes required to initiate bowel movements. If this quantity of the drug produces diarrhea, the dose is then reduced to 0.1 gm. When the patient becomes stabilized, on a dose of the drug which produces one or two stools daily, he is usually discharged from the hospital with instructions to take 0.2 gm. of acetylbetamethylcholine bromide each morning about 30 minutes after breakfast, and 1 or 2 tablespoonfuls of mineral oil each evening. He is seen again in 2 weeks.

An occasional enema is used if the patient becomes constipated or is troubled with gaseous distention of the colon.

The author is convinced that medical management of megacolon must be vigorously employed to minimize distention of the colon and to prevent nutritional changes in children, at least up to the age of 5 years. Medical management should be continued after that age, especially when the child continues to grow normally and continues to have satisfactory evacuations of the bowel. Proper preoperative medical management is frequently overlooked so that patients come to operation unprepared for an extensive surgical procedure.

The surgical measures used in the management of megacolon are: (1) emergency procedures after some acute surgical catastrophe such as volvulus, complete intestinal obstruction, gangrene of the obstructed loop of bowel, or peritonitis from perforation of the colon has occurred; (2) elective procedures such as sympathectomy or colectomy, either of which may be done alone or in combination.

Of 117 cases of megacolon subjected to sympathectomy (collected from the literature) complete relief was reported in 38 cases, and improvement in 64; there was failure to obtain benefit in 12 patients and 3 died. In the author's series of 19 patients with congenital megacolon, with an age distribution from 2 months to 20 years, 14 patients were subjected to sympathectomy. Only 1 of these failed to obtain satisfactory function of the bowel following operation together with many months of intensive medical management.

Sympathectomy will not produce satisfactory results in cases in which the muscle power of the colon has been lost. It has been observed that patients who showed hypertrophy of the colon and visible peristalsis did well following sympathectomy. When hypertrophy of the colon was absent, the improvement which followed the sympathectomy was minimal; in those patients in whom the disturbances of the colon had progressed to the stage of marked dilatation with thin, weak musculature of the colon, the results following sympathectomy were completely unsatisfactory. These patients were in constant danger of great gaseous distention of the bowel and kinking of the sigmoid loop.

Technically, the author believes that the operation of abdominal sympathectomy should be performed by the transperitoneal route since that approach also affords an excellent opportunity for the surgeon to examine the entire colon. By this route, both lumbar sympathetic trunks and their ganglia can be removed at the same operation. In the more advanced cases of megacolon, the author and his associates have utilized the abdominal sympathectomy operation by way of the transperitoneal route, and have removed most of the preaortic plexus of sympathetic nerves together with the inferior mesenteric plexus and its ganglia, the superior hypogastric plexus, and both lumbar sympathetic trunks with the second and third lumbar sympathetic ganglia.

The operation of sympathectomy does not always immediately restore the involved bowel to normal functional activity. It is sometimes necessary to use daily enemas, mineral oil, and even mild laxatives for several weeks before the habit of spontaneous evacuation of the bowel is established.

It is believed that partial colectomy is indicated in the segmental type of megacolon when only a small portion of the colon is hypertrophied and dilated, and the adjoining segments of the colon are relatively normal. The mortality in this type of operation is much lower than in those wherein extensive resection of the colon is necessary. The disturbing feature about the operation of segmental resection of the colon is not the immediate mortality, but the fact that progressive dilatation of the segment of the colon proximal to the portion which had been resected frequently takes place. Usually, however, the resection of segments of the colon gives excellent end-results and removes the danger of volvulus which develops all too frequently after sympathectomy. Patients with megacolon who have not been benefited by the combination of good medical management and sympathectomy should be subjected to partial or total colectomy if they can no longer be benefited by less drastic measures. In addition, those cases of megacolon which are due to low grade mechanical obstruction of many years standing, and not relieved by surgical removal of the obstructing lesion, should be subjected to colectomy. Subtotal colectomy should be done also on those patients with megacolon who show no contraction of the bowel or evacuation of feces following spinal anesthesia, and for whom intensive drug therapy fails to reduce the size of the involved colon, or to re-establish peristaltic activity.

The removal of a greatly dilated and thickened portion of colon is a somewhat different surgical procedure than the resection of a diseased portion of an otherwise normal colon. It is suggested that all of the involved colon should be resected by a one stage aseptic procedure, and, when possible, a temporary double-barrel colostomy should be constructed. This colostomy can be closed any time from a few weeks to several months, but not until the patient has shown definite general improvement. If the caliber of the entire colon is greatly increased, it is wisest to remove it entirely or at least to the upper part of the rectum. The proximal end of the rectum and the distal end of the terminal portion of the ileum are brought to the outside of the abdomen; the final anastomosis should be made as a second stage procedure at some later date. The above described method of approach allows the saving of some portions of the colon which may be showing only secondary changes that might be reversible.

It has been found that a liberal left rectus incision is satisfactory, for it affords adequate exposure of the splenic flexure of the colon which occasionally is very difficult to mobilize adequately. There is usually elongation of the mesentery of both the sigmoid and the descending colon, making easier the mobilization

of an enlarged colon. The anal sphincter muscles should be forcefully dilated at the completion of the colectomy and when the colostomy is closed.

Because of the poor healing qualities of the enlarged bowel, the result of long-standing distention and lymphatic stasis in the tissues, the single stage resection of a part of the colon in megacolon and an immediate anastomosis between the proximal and distal segments of the bowel is fraught with danger of serious complications. This one stage procedure is not recommended in the management of the more advanced types of megacolon.

EUGENE J. AUDI, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Colp, R.: The Treatment of Postoperative Biliary Dyskinesia. *Gastroenterology*, 1946, 7: 414.

A review of some of the studies of cholecystectomy series shows symptomatic cure or improvement in approximately 80 per cent of the cases of cholelithiasis and a much lower and more variable figure for cases of noncalculous cholecystitis. The patients with recurrent symptoms respond in a fairly high percentage to medical management but in all of the series a few cases, because of persistence or intensity of postoperative symptoms, again needed surgical exploration. In this latter group, the surgical findings varied and included such findings as calculi in the stump of the cystic duct, calculi in the common duct, acute pancreatitis, cholangitis, stricture of the papilla, and pancreatic cyst. However, in the majority explored, no gross pathological findings were found. The absence of organic findings upon which to base an explanation for colic in these cases leads to consideration of a functional factor or dyskinesia of the sphincter mechanism to explain not only recurrent or persistent symptoms following cholecystectomy but the pathological physiology of gall bladder disease.

The author recommends that the treatment of biliary dyskinesia at first be directed along a conservative medical course. Reflex or emotional factors should be sought. In the latter, reassurance and mild sedation may be effective. In menopause or difficulties in menstruation, proper hormone therapy may be effective in relieving the symptomatology. Constipation may be the reflex cause of the symptoms which may consequently be relieved by bile salts, mineral oil, magnesium sulfate, or daily sodium carbonate enemas. In patients with recurrent attacks of colic, elimination of biliary stagnation is attempted by frequent small feedings, for each period of gastric digestion is followed by a discharge of bile into the duodenum. Gastric acidity, if high, is controlled by antacids and a bland nonirritating diet to prevent flow of free acid into the duodenum which causes spincter spasm. Sodium nitrate or trinitroglycerol controls the colic in some cases, but more often morphine sulfate may be necessary to relieve the pain. Persistent or increasingly severe symptoms make surgical exploration mandatory to rule out an organic cause, or, as in the 8 cases presented by the author, to eliminate surgically intractable dyskinesia of the sphincter mechanism.

Surgical exploration should be meticulous and special attention should be given to the retroduodenal and papillary portions of the choledochus, a common hiding place for residual calculi. If organic exploration is totally absent it is then reasonable to consider intractable dyskinesia of the sphincter mechanism and this may be primary or secondary to a hypertrophy, stenosis, or inflammation of the papilla. Stenosis of the sphincter is best circumvented by choledochoduodenostomy. A spastic sphincter may be dilated by sounds or other means but these do not guarantee lasting relief. Sphincterotomy offers a more direct and definitive approach to the problem of spastic sphincter but has not been widely practiced either because surgeons did not believe dyskinesia of the sphincter was responsible for the symptoms or because they did not wish to use such a formidable procedure for a functional disease. The author submits the results in 8 cases in which he divided the sphincter without opening the duodenum, by means of an instrument first described by him in 1938 and which he calls a sphincterotome. This instrument sections the sphincter endocholedochally. Following the procedure the common duct is drained by a T-tube and by this means manometric readings of the intraductal pressure, lipiodal studies, and x-ray studies may be made.

Seven of the 8 patients in whom the sphincter was divided had had recurrent symptoms of pain, chills, fever, or jaundice. Of these, 6 experienced relief over a period of observation from 2 to 8 years following sphincterotomy. One of them had the retained stump of the gall bladder fixed to the side of the common duct which was dilated and thickened so relief may have been caused by its removal. One patient with recurrence of jaundice may possibly have passed a stone just prior to the operation which may have accounted for relief of the symptoms. In the remaining 4 no organic pathology was found. In 1 case the sphincter was divided at the time of the cholecystectomy, because there were only a few stones in a gall bladder showing little change, but the patient had had an attack of jaundice with colic. The common duct was normal and did not contain stones. The patient was free from discomfort 5 years after operation.

FREDERICK C. HOEBEL, M.D.

Kaijser, R.: Clinical and Pathohistological Aspect of Acute Cholecystitis. A Comparative Investigation. *Upsala läk. fören. förh.*, 1946, 51: 313.

The clinical classification of acute gall bladder disease as "acute cholecystitis" or as "noncomplicated stone colic" has been based chiefly on the presence or absence of hypernormal temperature, and as a rule no pathohistological evidence has been brought forth to support this division. A nonselected series of 176 surgically resected gall bladders were studied histologically, sections from various parts of

the gall bladders having been taken for purposes of examination, and the findings were correlated with the temperature at operation or during the last attack.

From 21 patients who, at the time of operation, ran a minimum temperature of 38° C., there were only 3 specimens that showed no material signs of acute inflammation histologically. From a group of 82 patients who, during the last attack, had had a rise of temperature to a minimum of 38° C., but at the time of operation had a maximum of 37.9° C., there were 46 specimens (55 per cent) showing plain signs of acute inflammation and 12 showing slight signs of acute inflammation. It is difficult to gauge the remainder of these cases because of the possibility that an acute inflammatory process had subsided between the time of the attack and that of surgical removal of the gall bladder. However, there were only 4 patients operated upon within a reasonably short time after an acute attack with a temperature of over 38° C., whose specimens showed no acute inflammatory changes. From a group of 70 patients who, during the last attack, did not have temperatures exceeding 37.9° C., there were 48 specimens showing no evidence of acute inflammatory change whatever. In the remainder of this group there were only 6 specimens in which an acute cellular infiltration of trivial appearance had occurred, not causing a rise of temperature beyond 37.9° C.

The conclusion to be drawn from this study is that the classification of a clinical series of cases of gall bladder disease into the groups "acute cholecystitis" and "noncomplicated stone colic," with division at the temperature level of 38° C., is fairly well substantiated by the pathoanatomical picture. Although there are patients running temperatures below 38° C., with pronounced acute changes in the gall bladder, as well as those with temperatures above that level having no acute changes, these divergences are not particularly frequent.

JOHN L. LINDQUIST, M.D.

Lasala, A., and Uriburu, J. V., Jr.: The Common Bile Duct. Surgery of the Pancreatic Portion. Technique of Finochietto. (Colédoco. Cirugía de la porción pancreática. Técnica de Ricardo Finochietto). *Prensa méd. argent.*, 1945, 31: 1491.

Gall stones fixed in the pancreatic and preangular portions of the common bile duct are always of surgical importance. If they are firmly attached, they cannot be mobilized upward with finger maneuvers, nor grasped with clamps as there is always the danger of duct lesions.

To remove such stones, the transpancreatic or transduodenal approach is employed. Moynihan advises sectioning of the pancreas with the thermocautery or separating it by blunt dissection. Walzel, Kehr, and others advocate transduodenal choledochotomy. The transpancreatic approach has often been criticized for there is always the danger of sectioning this gland, which sometimes lies like a broad coat upon the choledochus. R. Finochietto proposed the interpancreatic approach after many anatomic studies on the pancreatic choledochus. This method was used for 6 years with excellent success.

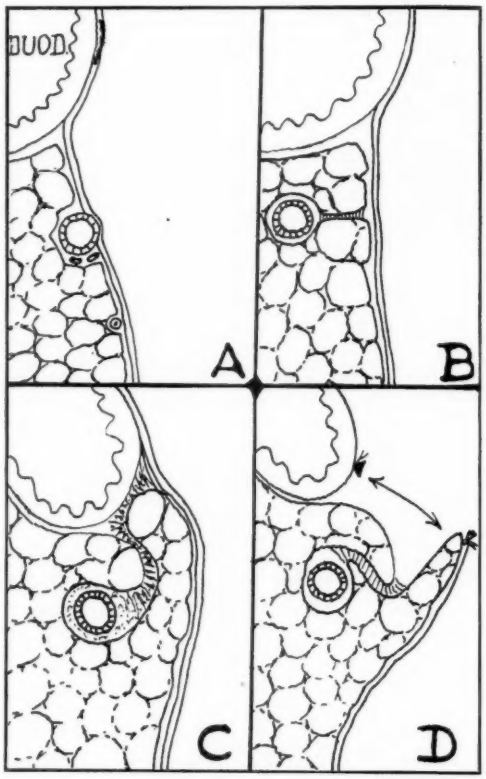

Fig. 1. (Lasala and Uriburu). Locations of the common bile duct.

Modern anatomic studies of Chylivich and Kozinventer, Belou, Zuckerkandl, and others, show that the choledochus is not intraglandular, as was thought some time ago, for it is only partially engulfed by the gland. Actually, it lies in a channel more or less deep at the posterior side of the gland and separated from it by loose connective tissue. This level must be found and the connective tissue removed in order to separate the pancreas and reach the choledochus without injury of the gland.

The following results have been observed by Finochietto in 100 dissections:

In 7 cases the choledochus was situated in a small depression covered exclusively by the lamina of Treitz and the pancreaticoduodenal vessels (Fig. 1-A). In 4 cases the choledochus was in a slightly deep depression, but covered in a small extension by

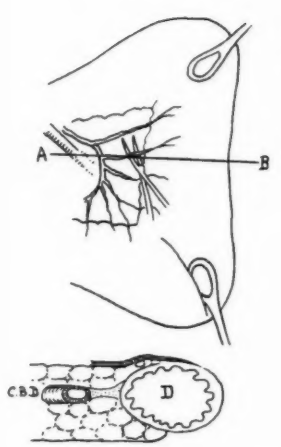

Fig. 2

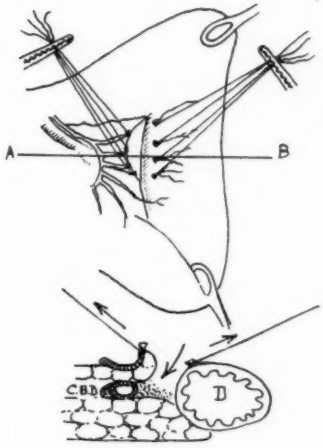

Fig. 3

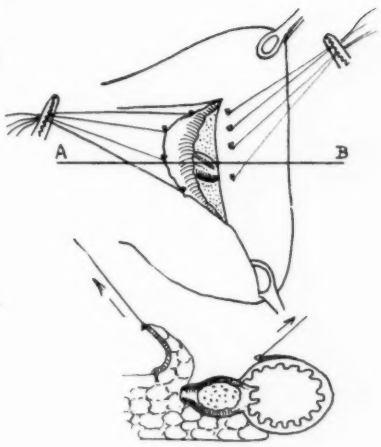

Fig. 4

Fig. 2. The duodenum and pancreas have been released and drawn to the right side. D: duodenum C.B.D.: common bile duct.

Fig. 3. Some of the pancreaticoduodenal vessels have been cut, as well as the fascia of Treitz which band of tissue extends from the pancreas to the duodenum.

Fig. 4. One of the flaps of the pancreas has been separated showing the choledochus. The stone is caught at the ampulla of Vater.

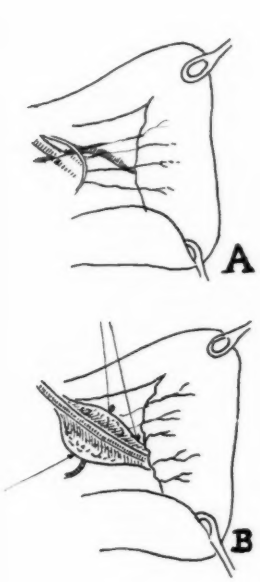

Fig. 5

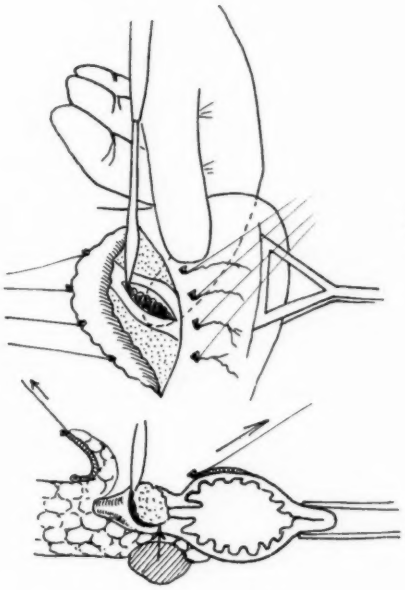

Fig. 6

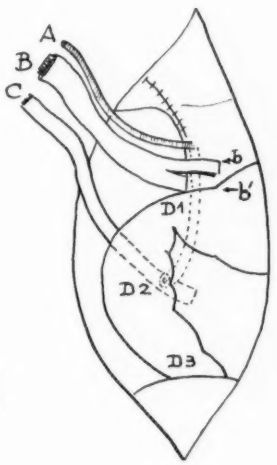

Fig. 7

Fig. 5. The most common case: transversal disposition of the pancreatic flaps.

Fig. 6. Preampullar incision of the choledochus.

Fig. 7. Drainage.

a portion of pancreas. In 3 cases it was situated in a deep depression, totally covered by two thick flaps of the pancreas (Fig. 1-B). In 7 cases the gland covered the choledochus, and apparently there was no interstice. The small branches of the pancreaticoduodenal vessels were ligated and the pancreas could be opened in the form of the leaves of a book and another deep layer was seen (Fig. 1-C). In 74 dissections, after separation of the superior pancreaticoduodenal vessels, it was possible to uncover a good portion of the duodenum by opening the pancreatic leaves (Fig. 1-D).

In 5 cases, the posterior side of the choledochus was overbridged by pancreatic tissue in a thin coat of 1 or 2 mm.

Finochietto says that therefore, in this series of dissections, and according to the anatomists, the choledochus runs in a depression of the posterior side of the pancreas in 11 per cent of the cases, and in a channel in 89 per cent. According to the surgeons, in 84 per cent of these 89 per cent of cases a single furrow of this channel could be made by just ligating and sectioning some little pancreaticoduodenal vessel and the choledochus found without sectioning even the smallest portion of the gland. In only 5 per cent of the cases would it have been necessary to cut the parenchyma to a small depth.

The study of the vessels of this territory, described in the classical work of Rio Branco and in the modern one of Pierson, is very interesting. The choledochus runs first side by side with the superior or posterosuperior pancreaticoduodenal artery, being crossed by these later, to join them at the posteroinferior pancreaticoduodenal artery in a bow from which start many small pancreaticoduodenal vessels. The ligation and cutting of these vessels render the pancreatic leaves movable.

In Finochietto's surgical technique the operating table must be horizontal with no dorsal angulation, and a Potter-Bucky screen is applied to obtain systematically an operative cholangiography by Mirizzi's method. Once the stone is localized in the pancreatic or preampular choledochus, the following operation is performed:

Step 1. Loosening of the duodenum and pancreas through Kocher's maneuver. Gentle pushing upward of the stone can be tried, or it can be grasped by a clamp through a supraduodenal choledochotomy. If it is not possible to remove it, an intrapancreatic choledochotomy is done.

Step 2. Insertion of a Béniqué's probe, size 30, into the supraduodenal choledochotomy to locate the choledochus and determine the thickness of the gland upon it. An interstice has to be looked for; it is commonly covered by areolar tissue and can be separated by disrupting the Treitz lamina.

Step 3. If step 2 is impossible ligation and section of the small pancreaticoduodenal vessels forming a bridge between the pancreas and duodenum must be done (Fig. 2). The ends of the ligatures must be left long in order that they may be grasped with forceps. The bridge formed by the fascia of Treitz will be cut (Fig. 3). Once the areolar interstice is found, the choledochus is reached by retraction (Fig. 4). In other cases the pancreatic flap lies crosswise and its retraction is easier (Fig. 5).

Step 4. The surgeon takes the loosened pancreas in his left hand and, with his forefinger pressing on the anterior side of the pancreas, pushes the stone toward the posterior side of the pancreas (Fig. 6). Transversal choledochotomy is performed to avoid section of the sphincteric fibers. The stone is removed.

Step 5. Suture of the inferior choledochotomy by joining of the edges of the pancreatic parenchyma and knotting of the suture ends (left long with a forceps attached).

Step 6. Fastening of the loosened duodenum and pancreas. Rubber dam drainage is left behind the pancreas at the level of the inferior choledochotomy. At the superior choledochotomy a thin Kehr's tube is put in to control postoperative biliary hypertension, because rupture of the sutures of the inferior choledochotomy or an infection could occur. This is also of benefit in postoperative cholangiography. Next to this tube, gauze and rubber dam drainage is placed (Fig. 7). H. MARINO, M.D.

Bisgard, J. D.: Pancreatitis as a Cause of Complete Obstruction of the Common Duct. *Ann. Surg.* 1946, 124: 1009.

The author presents in detail the reports of 2 cases of relatively painless extrahepatic obstructive jaundice. In both cases there was chronic cholecystitis without stones, and much evidence to support a diagnosis of chronic pancreatitis. Both patients recovered following surface drainage of the common duct.

In both cases the postoperative choledochograms showed narrowing of the distal end of the common duct suggestive of compression from pancreatic disease. In one case subsequent choledochograms were made and these showed a progressive increase in the filling of the constricted portion of the duct, which was interpreted as evidence of release of compression.

From the evidence, it is suggested that the obstruction of the common duct in these 2 cases probably was caused by chronic pancreatitis. The evidence is offered in support of the hypothesis that on occasion the swelling of the chronic pancreatitis obstructs the intrapancreatic portion of the common duct.

In making the diagnosis of chronic pancreatitis with obstructive jaundice, it is assumed that (1) the jaundice is extrahepatic in origin; (2) chronic pancreatitis exists; and (3) the assumed inflammation of the pancreas is capable of obstructing the common duct.

A diagnosis of chronic pancreatitis can be made with certainty only by histological confirmation. An elevated serum amylase is suggestive, if not indicative, of inflammation of the pancreas.

EMIL C. ROBITSHEK, M.D.

MISCELLANEOUS

Moore, M. T.: Symptomatic Abdominal Epilepsy. *Am. J. Surg.*, 1946, 72: 883.

Epilepsy, according to Hughlings Jackson, is the name for occasional, sudden, excessive, rapid, and local discharge of gray matter. Its manifestation in the patient depends upon the locus of the brain which discharges.

The more commonly observed motor Jacksonian seizure of isolated muscle groups is often the result of a discrete lesion (tumor, scar or other structural change) in the motor area, but should the lesion which initiates paroxysmal cerebral dysrhythmias be situated in another portion of the brain than the motor area the symptoms would logically be reflected in the somatic or visceral component of the body dominated by that part of the central nervous system. Thus, the author reasons, it is conceivable that focal lesions of any one or all of the areas three, five, and six, of Brodmann, of the cerebral cortex or diencephalon could produce, under appropriate conditions, abnormal discharges which would lead to disturbed gastrointestinal activity and resultant abdominal pain. This condition he defines as symptomatic abdominal epilepsy.

Abdominal distress and even pain which, according to one investigator, is due to abnormal gastrointestinal movements, has been observed to be a part of the preconvulsive aura of epilepsy. Wechsler and others have noted the occurrence of abdominal pain variously simulating gall bladder disease, peptic ulcer, appendicitis, and renal colic in cases of cerebral lesions.

The author discusses 5 representative cases in support of his contention. Of these, one is a case of brain tumor of area six, following the removal of which symptoms of recurrent, severe, epigastric pain disappeared. The second case is one of tuberous sclerosis with disseminated brain lesions in which one prominent symptom was recurrent attacks of severe abdominal pain. The third case is one of old cerebral trauma with numerous intervals of abdominal pain, nausea, and occasional vomiting and diarrhea following the injury. Electroencephalographic studies approximated the pattern seen in idiopathic epilepsy, and the patient was free of abdominal complaints following the institution of anticonvulsant medication. The fourth case is one of angioneurotic edema with focal cortical damage. The chief complaint was that of periodic cramping pain of the entire abdomen. On an anticonvulsant regimen, this patient was free of pain for a period of 7½ months. On cessation of medication the attacks recurred and were again halted by dilantin sodium. A characteristic abdominal seizure occurred when the sedatives were replaced by sodium chloride without the patient's knowledge, and complete relief was again afforded when anticonvulsant medication was resumed. In the last case no cerebral damage was demonstrable; however, the author believes that the prompt cessation of gnawing abdominal pain and accompanying epileptoid symptoms with anticonvulsants justifies the diagnosis of abdominal epilepsy.

The pathogenesis of abdominal epilepsy is discussed, and a routine for the complete study, diagnosis, and treatment of the condition is listed.

WAYNE CAMERON, M.D.

GYNECOLOGY

UTERUS

Molinengo, L.: Association of Endocervical Carcinoma with Fibromyoma of the Body of the Uterus (Sull' associazione di carcinoma endocervicale con fibromioma del corpo uterino). *Ginecologia*, Tor., 1946, 12: 133.

The simultaneous occurrence of fibromyoma of the body of the uterus and endocervical carcinoma has been observed by the author in 3 cases. Because of the difficulty in diagnosis which this combination presents, the importance of an endocervical exploration must be stressed. The precise diagnosis is important, as the presence of carcinoma suggests x-ray therapy while fibromyoma requires operative intervention.

This disease was suspected following a menorrhagia or metrorrhagia, and a discharge which varied from yellow, rose, red, coffeelike, and fetid. The endocervical mucosa was curetted and a microscopic examination revealed the diagnosis. With involvement of the pelvic peritoneum, severe local pain was present, although similar pain may be caused by rapid growth or hemorrhage into a fibromyoma.

The treatment advocated by the author is a total hysterectomy, either abdominal or vaginal, for carcinoma of the uterus, and a supracervical hysterectomy for fibromyoma. ARTHUR F. CIPOLLA, M.D.

Campbell, Z. B.: A Report of 2,798 Vaginal Hysterectomies. *Am. J. Obst.*, 1946, 52: 598.

This report covers 2,798 vaginal hysterectomies for benign disease of the uterus performed at the Presbyterian Hospital, Chicago, by the attending and resident staff. The mortality is compared with that of 4,482 vaginal and 40,587 abdominal hysterectomies reported in the literature. The mortality rate of the collected cases of abdominal hysterectomy is 7.5 times greater than that of the vaginal hysterectomy.

The author prefers vaginal hysterectomy because: (a) it permits a more regular correction of all defects than do other procedures; (b) the vaginal route causes less discomfort to the patient; (c) no abdominal scar is produced; (d) pulmonary complications and emboli are less frequent; (e) thrombophlebitis and pelvic abscess are less common; (f) trauma to the bowel, postoperative adhesions, and ileus and bowel obstruction are infrequent; (g) gas pains are less severe; (h) it is less radical and safer than irradiation; (i) it affords a safe approach to many forms of adnexal pathology; (j) peritonealization can be accomplished as accurately as by the abdominal route; and (k) stump carcinoma and persistent cervical discharge are prevented.

The author agrees with many who have advocated vaginal hysterectomy rather than abdominal hysterectomy in poor operative risks. It then seems logical that vaginal hysterectomy is an even safer procedure in patients who are in better operative condition. Previous abdominal surgery need not always contraindicate vaginal removal of the uterus. The technical skill of the operator is of no greater importance than is the choice of method of approach or preoperative preparation of the patient, such as: (a) eradication of foci of infection; (b) correction of anemia, and vitamin, protein, and fluid balance; and (c) restoration of the normal vaginal flora. Meticulous hemostatis is vitally important.

Adequate training in vaginal hysterectomy will equip a surgeon with the confidence and ability to treat many other gynecological conditions by vaginal surgery to the great benefit of the patient.

JOHN R. WOLFF, M.D.

Falk, H. C., and Bunkin, I. A.: A Study of 500 Vaginal Hysterectomies. *Am. J. Obst.*, 1946, 52: 623.

The authors report 500 consecutive vaginal hysterectomies, with and without anterior and posterior vaginal wall repairs, performed on the gynecologic service at Beth Israel Hospital, New York, over a 5 year period from January, 1940 through 1944. A group of 14 operators took part in the work, all following a standardized fixation-ligature technique.

According to the obstetric standard of morbidity (a rise in temperature to 100.4 degrees on any 2 days after the day of operation), 106 cases, or 21.1 per cent, were morbid. One hundred and ninety-three patients were given sulfonamides prophylactically following operation, and 46, or 23 per cent, became morbid; 307 did not receive sulfonamides, and 56, or 18 per cent, were morbid. One hundred and sixteen patients had gross or microscopic cervicitis as reported by the pathologist, and 25 or 21 per cent were morbid. Of the 384 patients without cervicitis, 77, or 20 per cent, showed morbidity. When vaginal hysterectomy alone was performed, the morbidity was 19.4 per cent. When perineal care was added, the morbidity was only 15.5 per cent, but when bladder repair was also done, the morbidity rose to 24.5 per cent. Bladder repair also increased the incidence of voiding difficulties. Of the 500 patients, 73, or 14.6 per cent, developed pus in the urine; 34 of these had received sulfonamides prophylactically.

There was 1 death in the series, a mortality rate of 0.2 per cent. This followed a septic course with pelvic peritonitis, abscess, and perinephritic abscess.

There were 3 cases of pyelonephritis, 1 case of pelvic phlebitis, 1 of pulmonary infarct, 1 of transient pulmonary edema, 1 of transient auricular flutter, and 3 cases of pneumonia. The bladder was injured twice but immediate suture led to recovery. There were no ureteral injuries, injuries to the rectum, or fistulas. Postoperative bleeding occured

twice, once from the vaginal cuff, and once from the perineum. Two patients returned with ovarian cysts necessitating removal.

The authors believe that vaginal hysterectomy is an operation associated with a minimum of shock and hemorrhage, low morbidity, and low mortality. It is the procedure of choice in the obese and the aged. Nulliparity is not a contraindication. The fixation-ligature technique is safe, and readily taught and learned. JOHN R. WOLFF, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Mocquot, P., and Musset, R.: Nongravidic Ovarian Hemorrhages (Les hémorragies ovariennes non gravidiques). *Gyn. obst.*, Par., 1946, 45: 337.

Hemorrhages of the ovary may be secondary to a systemic or local pathological process. Infectious diseases like typhoid, smallpox, cholera, as well as poisonings with phosphorus or antimony, extensive burns, blood dyscrasias, or cardiac failure, are among the general processes which may cause ovarian hemorrhage, while tumors, torsion of the adnexa, and endometriosis are among the local ones.

More frequent but more puzzling as to their etiology and pathogenesis are the primary hemorrhages. These may either occur freely in the peritoneal cavity, or form localized hematomas within the ovary. In hemorrhages bleeding into the peritoneum, the gross appearance of the ovary may vary considerably; sometimes it is enormous and of wine red color, resembling splenic pulp on the cut surface: other times the volume is increased only in parts, revealing hemorrhagic zones and cysts filled with blood. The amount of bleeding may vary from minor seepage to profuse apoplexy of the ovary which calls for immediate surgery. Often, adhesions are found, but whether these are the cause or a sequel of the bleeding has not been decided. The histological examination shows that the hemorrhages may originate from a Graffian follicle or from a corpus luteum; on the other hand, interstitial hemorrhages originating from the stroma seem to be not infrequent.

Very little is known of the pathogenesis and etiology of primary hemorrhages. Clinical and experimental experiences seem to indicate a hormonal origin. The most plausible theory is that a sudden excessive activity of the anterior pituitary lobe leading to hyperprolanemia causes the syndrome, but nothing definite is known yet of the mechanism. The hormonal theory is supported by the clinical picture; the hemorrhages have never been observed before the menarche or after the menopause; more than half of the cases occur in virgins only a short time after the menarche; other cases occur during lactation or in women with irregular menstruation. All this indicates a disturbance in the hormonal equilibrium. In the acute cases, the symptoms are dramatic, resembling those of ectopic pregnancy or acute appendicitis. On the other hand, there are women who suffer from these crises more or less regularly between the twelfth and eighteenth days of the menstrual cycle, i.e., synchronously with ovulation. These crises are often violent, and are accompanied by vomiting and even syncope. Vaginal examination during the attack often reveals doughy swelling of one ovary with extreme tenderness. This sign clears up after a few days only to be repeated after 1 or 2 months.

The treatment should be surgical in the acute cases, and conservative and symptomatic in the chronic ones. WERNER M. SOLMITZ, M.D.

MISCELLANEOUS

Scott, W. W., and Ekas, W. L.: An Operative Procedure for the Repair of the Urethrodiverticulovaginal Fistula. *Surgery*, 1946, 20: 645.

Urethrodiverticulovaginal fistula is an uncommon lesion. A review of much of the literature on diverticulum of the female urethra and the urethrovaginal fistula revealed but two cases.

From the location and character of the urethrodiverticulovaginal fistula, it is reasonable to assume that it can be classified as an acquired rather than a congenital lesion. Furthermore, it would seem that the identical conditions which play a role in the development of the urethral diverticulum are the essential factors in its causation.

The authors state that while our knowledge of the symptoms of this disease is quite limited because of our meager personal observations and the scarcity of information on the subject in the literature, it seems safe to assume that for the most part these symptoms will be quite similar to those of the urethral diverticulum. In addition, in most of these cases, there will be urinary incontinence concomitant with vaginal irritation and dyspareunia. In 2 cases in which the tumor was present for some time before drainage was established, the patients were quite sick, having chills, fever, nausea and vomiting, and low back pain. All of the patients had frequency, urgency, dysuria, and urinary obstruction in varying degree.

The diagnosis of this condition is not difficult once the possibility of a ureterovaginal or vesicovaginal fistula has been ruled out and the presence of an urethral diverticulum proved.

The successful repair of this condition, as in the case of the vesicovaginal fistula, depends in no small measure upon the preoperative preparation, and most especially upon meticulous care following operation.

The authors have presented an operative procedure used successfully in the repair of 2 of these cases. HARRY W. FINK, M.D.

Beecham, C. T.: Conservative Surgery in Endometriosis. *Am. J. Obst.*, 1946, 52: 707.

Conservative surgery in the treatment of endometriosis is the predilection of all gynecologists. To the author, conservative gynecological surgery means the removal of the least possible tissue to obtain the

desired result. Hence, every attempt is made to preserve ovarian function to the age of 45 years or beyond, if the lesion permits, and in previously sterile women, to preserve the childbearing capacity to the age of 40 years. A patient with endometriosis who has her family, obviously minimizes the latter consideration.

The author surveys 80 conservative cases encountered in the past 6 years. By means of conservative methods, such as removal of endometrial implants, resection of diseased ovaries, and the correction of a retrodisplaced uterus, he has been able to salvage the childbearing capacity in 32 cases, or 52.5 per cent. Ovarian tissue was salvaged in whole or in part in 14 patients (25%) but this was impossible in 15 instances (24.5%). Nineteen of the patients were more than 45 years of age, and radical surgery was employed in all but 3. In the 6 years, only 2 of the conservatively treated patients had recurrent complaints.

Since 42 per cent of the patients had a retrodisplaced uterus, the author believes that there is a close relationship between this condition and endometriosis. Beecham recommends that women with nonpathological retrodisplaced uteri be observed at regular intervals for signs of fixation indicating a surgical need for treatment of probable endometriosis.

The author concludes that conservative surgery is definitely worth while and should be the major consideration when operating upon endometriosis.

JOHN R. WOLFF, M.D.

Teilum, G.: Arrhenoblastoma—Androblastoma. *Acta path. microb. scand.*, 1946, 23: 252.

The author here describes a series of homologous tumors of the ovary and testis which he calls the arrhenoblastoma-androblastoma series.

He states that in studies of ovarian tumors made during the past 25 years, histogenesis was the basis for classification. Classification, however, is still uncertain in some tumor forms because of the highly variable histological pattern.

He refers first to the ovarian arrhenoblastoma which is characterized clinically by a more or less pronounced masculinizing effect and, according to Robert Meyer, originates from testicular elements remaining from the early stages of gonadogenesis. There is the one extreme, represented by the testicular adenoma of the ovary, and the other extreme which is a diffuse blastema often with sarcomalike differentiation and a more or less pronounced tendency toward epitheliallike differentiation. He makes the observation, as others already have, that the strongest virilizing effect is noted in patients with the least differentiated forms of tumor. The clear cut tubular adenoma shows hardly any hormonal effects.

He reviews Robert Meyer's concept of the origin of the ovarian arrhenoblastoma—the view which is now widely accepted, namely: the arrhenoblastoma originates from the undifferentiated germ cells that have kept their germinal potency throughout the period of development. Thus, if part of the rete blastema with its medullary cords remains undifferentiated and later, for some unknown reason, commences to grow, a tumor of masculine germinal epithelium may develop in the rete ovarii.

The author points to the morphological congruity between certain testicular tumors and ovarian arrhenoblastomas, apart from the clear cut tubular adenoma. He refers to these homologous tumors as the androblastoma series.

He describes a feminizing testicular tumor which has the same structure as an ovarian arrhenoblastoma. The patient from whom it was removed presented himself with increasing gynecomastia, a loss of libido, and a testicular tumor. The tumor showed all the stages of differentiation seen in the typical virilizing arrhenoblastoma of the ovary. The author shows the microscopic pictures of this tumor and points to its close similarity to an ovarian arrhenoblastoma. He likewise shows photomicrographs of 7 other testicular tumors and similar microscopic pictures from ovarian tumors. The morphological likenesses noted in this feminizing tumor and in the virilizing arrhenoblastoma, along with the gradual transition in some parts to a structure like that of a clear cut lipoid cell tumor allows the author to elucidate on several points.

He says that it proves Meyer's view that the ovarian arrhenoblastoma also originates from a particular testicular anlage. One can follow the continuity of various stages of differentiation in this male tumor as in the ovarian tumor described by Meyer. This gradual transition from tumor tissue of the arrhenoblastoma type to a clear cut lipoid-cell tumor is taken to prove that the latter represents a particular form or variant of the androblastoma series. In the ovary we meet with virilizing or defeminizing tumors rich in lipoid, the histogenesis of which has been disputed. It is said that they arise from aberrent adrenal cortex (ovarian hypernephroma) or they have been taken to be lutein cell tumors (luteoma), luteinized granulosa cell tumors, or the neutral masculinovoblastoma. The author believes that these tumors in the ovary are particular forms of the arrhenoblastoma series originating through one-sided differentiation of lipoid cells within the blastema.

The tumor described in this paper, with its gradual transition from tumor tissue of the androblastoma type to lipoidal cell tumor—which histologically corresponds to the tumors described in the ovary as luteoma and adrenal tumor—affords a definite proof of such a histogenesis. In other words, most of the cases described as luteoma, adrenal, or hypernephroid tumors have to be looked upon as representing a particularly lipoid form of the ovarian arrhenoblastoma.

It is a peculiar fact, he states, that tumors of this series which are virilizing in women may have feminizing effects in men. This corresponds to the effect described for certain tumors of the adrenal cortex. In men, occasionally, feminization with gynecomas-

tia, testicular atrophy and increased estrin values in the urine are noted. The paradoxical hormonal effect in men is thus common to all these tumors, including the androblastoma which he describes.

The author presents one chart showing the homologous tumors of this series together with similar but not homologous tumors of the granulosa group.

HENRY C. FALK, M.D.

Vaccaro, H., Cabezas, J., and Berrios, H.: The Importance of Lysozym in Gynecology and Obstetrics (Factores inespecíficos de defensa en ginecología y obstetreca. Importancia del lisozima). *Bol. Soc. chilena obst. gin.*, 1945, 10: 233.

The importance of lysozym as a defense factor in gynecological and obstetrical patients was evident in the following observations. In gynecologically normal women, the vaginal flow contained a high lysozym titer, while the cervical flow, although containing lysozym, contained a lower titer, or in some cases none at all. No constant parallel was found between the lysozym content of the cervix, and that of the vaginal wall. Lytic inhibitory power was found in dilutions of 1:800 in 6 hours of contact, while in the same length of time, the highest dilution in which the cervical content showed action was 1:400. The vaginal flow without previous dilution had its lytic inhibitory action after 5 minutes, while the cervical flow under the same conditions showed its power after an hour.

In gynecologically affected women under identical conditions as those shown above, there was an appreciable diminution of the lytic inhibitory power, while the maximum effective dilutions were half of those in the normal group. The lysozym contents of the cervix and vagina were similar to those of the normal group, and were predominant at the vaginal wall level.

Pregnant women revealed an increased lysozym content in the genital flow; however, the stage of pregnancy has no influence on the lysozym titer. The difference between cervical and vaginal concentration was similar to that in the previous groups.

In puerperal women the lochia had a lower lysozym content than that of pregnant women, of the normal group, and of those with gynecological diseases. The lysozym content was nil in most of the cases.

Amniotic fluid contained practically no lysozym.

The following procedure was used in determining the lysozym titer: 10 c.c. of sterile serum were washed against the cervix or vagina and this specimen was diluted with 10 c.c. of sterile physiological serum. This mixture was placed in a water bath at 60 degrees for ½ hour 3 times, with an interval of 24 hours each. The resulting solution was sterile, having a total lysozym content. One cubic centimeter of the above solution is added to 0.1 c.c. of a bacterium emulsion of Bacterium Sarcina, and incubated at 37 degrees for 24 hours. One cubic centimeter is removed, placed in a test tube containing agar at 42 degrees, and this mixture is then placed in a petri dish and incubated at 37 degrees for 24 hours. It is then examined at 24, 48, and 72 hours and compared with the serum from 3 controls.

ARTHUR F. CIPOLLA, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Mayer, C.: The Quantitative Analysis of Urinary Estrone in the Course of Pregnancy (Le dosage de l'oestrone urinaire au cours de la grossesse). *Bruxelles méd.*, 1946, 26: 1181.

Estradiol is the fundamental estrogenic substance elaborated by the ovary. Two derivatives of this substance occur in human urine, estrone and estriol. It is the former, however, which is chiefly responsible for the estrogenic activity of female urine.

Two methods are utilized for the quantitative analysis of urinary estrone. The biologic method is based on establishment of the minimal dose of extract capable of provoking keratinization of the vaginal cells in the spayed mouse and rat. The colorimetric method is based on the fact that pure estrone reacts with betanaphthol sulfuric acid to form a rose color. This reaction is quantitative and the intensity of color change may be measured by comparison with standard solutions. Other substances present in the urinary extract will also produce a color, but the color due to estrone is destroyed by the addition of hydrogen peroxide. Hence, accurate estimation involves a determination of the difference in color before and after the addition of peroxide.

A review of the variations reported by other investigators is confusing because of different unit measures. To eliminate this confusion the author has proposed the following arbitrary classification:

1 mouse unit equals 8 international units.
1 rat unit equals 32 international units.
1 international unit equals 1/10 gamma unit.
1 gamma unit equals 1/1000 milligram.

Colorimetric quantitative analyses were made of urinary estrone during the course of pregnancy for 10 women. As early as the sixth week the urinary estrone level was found to be at least twice the highest level found in nonpregnant women. Large individual variations occurred but in general the highest figures were obtained when the placenta was very large and was associated with a large baby. A prompt fall of the level followed childbirth and expulsion of the placenta.

These studies are interpreted as supporting the contention that considerable augmentation of urinary estrone occurs in the course of pregnancy and that this augmentation is due to the secretory activity of the placenta. EDWARD W. GIBBS, M.D.

O'Connor, C. T., and Bradley, J. J.: Retroperitoneal Hemorrhage Complicating Pregnancy. *N. England J. M.*, 1946, 235: 648.

Retroperitoneal hemorrhage complicating pregnancy is extremely rare but probably occurs more frequently than reports indicate.

One type is characterized by severe abdominal pain and shock as a result of massive retroperitoneal hemorrhage in the upper abdomen. The most frequent source of the hemorrhage is disease in the kidney and its vessels. The condition is usually fatal.

The other type, reported here for the first time, is retroperitoneal hemorrhage occurring chiefly in the true pelvis and resulting in a tumor causing dystocia and necessitating cesarean section.

The source of the hemorrhage in the case reported was probably one of the hemorrhoidal veins. Such a hemorrhage should not be evacuated; its complete absorption may take months.

CHARLES BARON, M.D.

Keller, M.: Ovarian Hemorrhages Caused by Nidation of the Fertilized Ovum at the Level of the Ovary (Les hémorragies d'origine ovarienne déterminées par la nidation au niveau de l'ovaire de l'oeuf sécondé). *Gyn. obst.*, Par., 1946, 45: 359.

Hemorrhages due to implantation in the ovary may cause hematomas in different parts of ovarian tissue; they may be interstitial, parenchymatous, subcortical, periovular, or in preformed cysts. They are of different age and varied extent; on rare occasions they may rupture and cause a secondary intraperitoneal hemorrhage. The intraovarian hemorrhages are due to the invasion of the chorionic villi into the capillaries and small veins of the maternal circulation; in rare cases bleeding may occur also by diapedesis in abnormal permeability of the capillary wall. If, on the other hand, nidation occurs on the surface of the ovary, in a groove of the albuginea, intraperitoneal hemorrhage ensues. Small and repeated hemorrhages are likely to form a hematocele in the cul-de-sac of Douglas, while more extensive hemorrhages spread in the abdominal cavity. The amount of bleeding varies considerably; it may be almost nil but often reaches 400 or 500 c.c., and in rare cases it may be as high as 2,000 c. c.

Histological studies reveal the most significant disturbances at the point where the fetal tissue is contiguous to the maternal. Here the Langhans cells attack the ovarian tissue, invading the walls of the capillaries and small veins and forming the intervillous spaces, which are filled with blood. Close to the points of invasion by ectodermal cells, extravasations of blood can be observed as the first stages of the intraovarian hematomas; sometimes a considerable periovular hematoma is formed which causes detachment and death of the ovum. A true decidua is not formed in ovarian pregnancy. The absence of a decidua vera makes the nidation precarious and predisposes to intraovarian or intraperitoneal hemorrhages.

In the later stages of pregnancy, i.e., after the fifth month, hemorrhages into the ovary and the fetal sac are rare occurrences, and the pregnancy

may continue until term; on the other hand, in this stage of development, there is grave danger of severe hemorrhages during surgical intervention, especially in the attempt to separate the placenta.

It has never been possible to diagnose ovarian pregnancy preoperatively; all we can do is to diagnose an ectopic pregnancy in general and leave the correct diagnosis of ovarian pregnancy to the time of operation. If the operation has to be done in advanced stages of pregnancy or close to term, the technical difficulties can become very serious; in the attempt to separate the placenta, hemorrhages may occur which may endanger the life of the patient. In these cases marsupialization is sometimes the only safe procedure. WERNER M. SOLMITZ, M.D.

Socías, G.: Fetal Survival in Premature Separation of the Normally Inserted Placenta (Supervivencia fetal en el desprendimiento prematuro de la placenta normalmente inserta). *Bol. Soc. chilena obst. gin.*, 1946, 11: 102.

In premature separation of the normally inserted placenta, fetal survival is an exceptional occurrence. However, the problem of survival of the fetus in these cases is secondary because the severity of the condition does not warrant favoring of the fetus. Among 32 cases observed from 1941 to 1946, only 12.5 per cent of the fetuses survived.

Evaluation of the viability of the fetus may be explained by a comparison of the area of separation to the total area of the placenta. If the site of separation is near the great vessels the possibility of survival is small. Measurement of the weight of the clot is of no value, as the clot not only forms on the placenta but also outside of the site of the separation.

One theory of fetal death is attributed to shock produced by histamine liberated from the traumatized placental tissue. The histamine is absorbed by the fetus and produces death mostly in premature or defective fetuses, which explains death in the cases with small separation. ARTHUR F. CIPOLLA, M.D.

Tisdall, L. H.: The Present Status of Transfusion of Whole Blood and Its Derivatives in Obstetrics and Gynecology. *Am. J. Obst.*, 1946, 52: 788.

Blood transfusions are an essential form of obstetric and gynecologic therapy. In view of the recent advances in our knowledge of this subject, obstetricians and gynecologists have a threefold responsibility:

1. To have an ample supply of whole blood and plasma available. This can be assured by the establishment of a community blood bank such as has been suggested by the Red Cross.

2. To demand that the collection, preservation, and administration of whole blood and plasma conform to the best technical standards. The adoption of the closed system vacuum technique and the use of the ACD preserving solution will meet such criteria.

3. To insure that blood or plasma administered to patients must be beneficial without reaction, and to avoid antibody stimulation which may subsequently cause difficulties in later pregnancies or transfusions. This can be accomplished under a pyrogen-free technique by the use of group and Rh compatible blood for routine transfusions, of Rh-negative group O blood with a low titer of isoagglutinins for emergency transfusions, and of a compatible group or group O plasma with a low isoagglutinin titer when plasma is indicated. JOHN R. WOLFF, M.D.

LABOR AND ITS COMPLICATIONS

Snoeck, J., and Rocmans, M.: The Management of the So-called "Normal" Delivery by the Obstetrician. Obstetrical Analgesia (Quelle doit être la conduite de l'accoucheur pendant l'accouchement "dit normal." L'analgésie obstétricale). *Gyn. obst., Par.*, 1946, 45: 257.

This article gives a comprehensive account of all aspects of obstetrical anesthesia and analgesia. It includes an excellent detailed description of the anatomy of the central and autonomous nervous systems in their relations to the innervation and function of the uterus and to obstetrical anesthesia. Instructive illustrations are added.

The authors discuss the advantages and drawbacks of all known methods and drugs used for analgesia and anesthesia in obstetrics. Of special interest is the discussion of the different methods of producing peripheral anesthesia. This chapter includes epidural, paravertebral, and continuous caudal anesthesia, as well as the blocking of the lumbar sympathetic nerve by injection into the paravertebral ganglia, the superior or inferior hypogastric plexus, and the internal pudendal nerve.

The conclusions at which the authors arrive differ considerably from the consensus in the United States. This difference of opinion may be due partly to the fact that in France there are fewer highly and specifically trained anesthetists than in this country. In the category of inhalation anesthetics, the authors consider nitrous oxide as the only agent without any toxic side effects for mother and child. It demands a minimum of supervision and does not inhibit the uterine contractions. However, it does not produce complete anesthesia; often the pain is only attenuated. Cyclopropane is quite satisfactory but it demands a highly trained and experienced anesthetist and a complicated and expensive apparatus. All other inhalation anesthetics are considered too dangerous for mother or child, or both.

The groups of opium derivatives and barbiturates should be rejected altogether as they are too ineffective in small doses and too dangerous in large ones.

As to the different methods of anesthesia by blocking pain conduction either in the spinal medulla or in the peripheral nerves, the authors believe that these are still in the experimental stage and should be studied further before they are accepted as safe and effective. Of the different methods of this kind, the authors prefer the infiltration of the lumbar sympathetic nerve, whereas caudal anesthesia,

(little known in France) seems to them to be complicated in its technique and not without risks (convulsions or circulatory collapse).

The details of this very interesting article should be read in the original. WERNER M. SOLMITZ, M.D.

Gosselin, O.: The Management of the So-called "Normal" Delivery by the Obstetrician. Not Including Analgesia and Anesthesia (Quelle doit être la conduite de l'accoucheur pendant l'accouchement "dit normal." Analgésie et anesthésie exceptées). *Gyn. obst.*, Par., 1946, 45: 288.

Even if there is no anatomical obstacle or other condition which demands intervention in the interest of the mother or child, a delivery can no longer be considered normal if the duration of labor exceeds a certain time limit. "The sun should not rise twice over a woman in labor" (Doederlein). It is no longer justifiable to maintain an attitude of purely passive expectancy in prolonged labor. The danger is twofold: infection after the membranes are ruptured, and asphyxia of the child by tetanic contractions of the uterus. No delivery should be termed "normal" which has not been completed within 10 or 12 hours after rupture of membranes. The main reason for prolonged labor in "normal" cases is disturbance of uterine contraction and dilatation of the cervix, caused either by spasticity and hypertony of the cervix, or by weakness and inertia of the uterine muscle. The dilatation of the cervix is not a passive phenomenon due to the pressure of the bag of waters on the cervix, but rather an active process caused by the traction of the spiral fibers of the corpus on the fibers of the cervix. The "physiologic delivery" is due to the harmonious interaction between contraction of the upper and relaxation of the lower part of the uterus.

Prolonged labor due to spasm of the cervix should be treated by rupture of the membranes and with antispasmodic drugs. A number of outstanding French obstetricians rupture the membranes routinely in all cases when the cervix is dilated to 2 cm. and others at a dilatation of 4 or 6 cm. Objections against this routine can be made for two reasons, i.e., increasedd anger of bacterial invasion, and danger of prolapse of the cord. However, these dangers seem to be negligible as the saprophytic germs of the vagina seldom cause infection, and prolapse of the cord is of rare incidence (½% in a series of 575 cases).

The antispasmodic generally used in France is called spasmalgine; it is a mixture containing pantopon (0.01 gm.), papaverine (0.02 gm.), and atropine (1 mgm). Many outstanding men (Kreis, Voron, Pigeaud) give it routinely in all cases. If necessary, it can be given several times in intervals of 30 minutes without danger to the mother and child.

Prolonged labor due to the opposite disturbance, namely, weak contractions, should be treated by oxytocics. In contrast to the opinion prevailing in the United States, the French authors deem it permissible to use pituitrin also in the second stage of labor, provided that it is given in very small doses (2 international units) and under close supervision. In some cases, it is advisable to combine the pituitrin with an antispasmodic. WERNER M. SOLMITZ, M.D.

Levy-Solal: Anomalies of Uterine Contraction (Anomalies de la contraction utérine). *Rev. fr. gyn. obst.*, 1946, 41: 225.

Extreme prolongation or even arrest of labor is often seen in cases of functional uterine dystocia. In the studies of uterine contraction, particularly by means of external hysterography, a great deal may be learned; in the cases of hypercontractility one sees either (1) inertia or functional insufficiency of the uterus or (2) an excess of contractions, either intermittent or tonic contractions.

The hysterograph is composed essentially of a large pneumatic tube and an oscillograph. The tube held in place by an inextensible belt is inflated under a known pressure; the excursions transmitted from the tube are recorded on a drum which revolves at a known rate of speed. Normal contraction appears as a line ascending sharply, then a plateau more or less notched and then a line descending slowly to the base line. The height of the peak is a measure of the maximal power of the contraction (or uterine tonus), and the line its duration; labor contractions are represented by the area bounded by the base line and the arc.

Intermittent and involuntary uterine contractions become painful during labor. The pain appears somewhat in advance of the contraction and disappears shortly after it. It is only perceptible above a certain threshold; this explains why the mild contractions, such as those which follow immediately after the expulsion of the fetus, pass unperceived both by the woman herself and the obstetrician.

The duration of the contractions is from 10 to 20 seconds. The contractions follow a rhythm which varies not only from one patient to another but also in the same patient, starting with a duration of 10 minutes and ending with a duration of 3 minutes. Each contraction is followed by a period of repose, the state of tension of the uterus or its absence being designated by either an arc or a horizontal line (Graph 1). Physiologically, the uterine tonus is always the same, varying only if the uterine capacity is suddenly changed as, for example, by the rupture of the membranes. Pathological variations of tonus are observed chiefly in the hyperkinesthetic uterus. The persistence of pain during the period between contractures is a sign of poor muscular relaxation. In cases of inertia or functional uterine insufficiency one sees undulations and shortening of the base line, and the intervals are very long, lasting from 15 minutes to even several hours (Graph 2). Intermittent contractions show up as a successive series of similar waves with the common characteristic of a constant return of the peak to its base line of departure as long as the contraction retains its forcefulness (Graph 3). One sometimes sees a series of unremitting ineffective contractions (Graph 4); this state of contraction can evolve following two eventualities: (1) after a

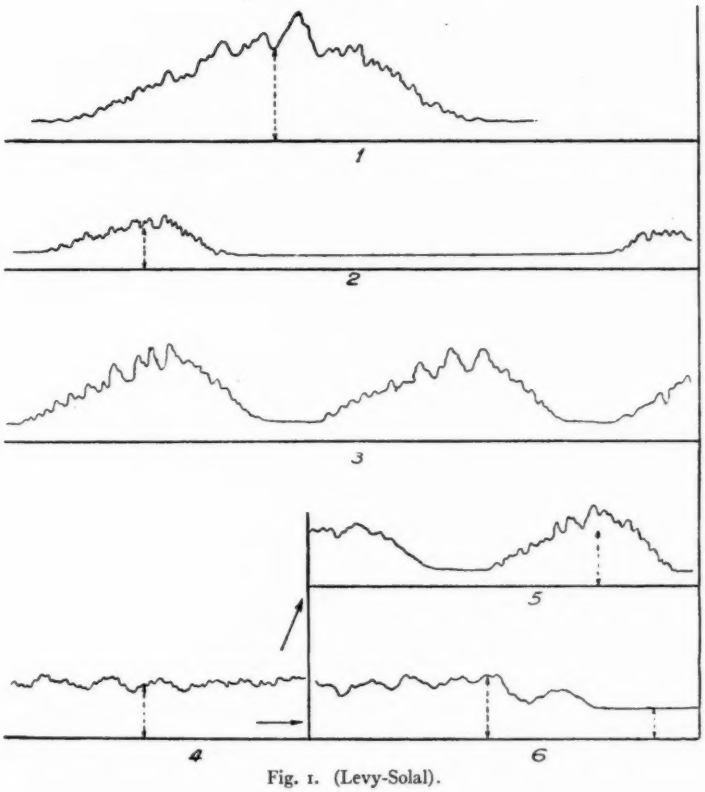

Fig. 1. (Levy-Solal).

more or less protracted period of successive spikes (Graph 5), as may be observed following the administration of barbiturates and (2) between maximal contractions irregularly placed when the intervening quiet period is represented by a horizontal line at the lowest point; in this case the decrease in the severity of labor is due not to a state of inertia or to the effacement of the contractile wave but to an elevation of the tonus (Graph 6). This latter state, due to muscular overwork, provokes an arrest of labor; it does not represent uterine inertia, and oxytocics should not be employed. Rather, antispasmodics or even morphine should be used to diminish the resistance due to muscular hypertonicity to give each contraction its full value. When the tracing discloses a permanent elevation of the muscular tone then spinal anesthesia is indicated; thus, the contractility is abolished and the retraction of the uterine body and its tonicity are augmented.

These anomalies, i.e., functional insufficiency or excess of contractions, may be due to various causes; there may be congenital central or autonomic nervous system derangements, or there may be fibrosis or sclerosis of the uterine musculature which breaks up the contractile wave before it reaches the base of the uterus. In general, however, the neuromuscular system is normal and the contraction is vitiated secondarily. This is not only a reaction of the uterine muscle; it may also be due to an abuse of hypophyseal extracts, or to repeated and prolonged mechanical excitations by obstacles difficult to overcome. Also, these difficulties follow more or less tardily after a phase of regular contractions.

The obstacle may be due to either (1) resistance of the soft tissue, the inferior segment, or the uterine collar, or (2) fetal disproportion. The inferior segment may be either rigid or supple. The neck can be the site of diverse alterations which add to the complication of anatomic malformations or inflammation involving the normal course of effacement and dilatation, often produced by scar tissue secondary to the intemperate use of caustics. As for the fetal head, it may be imperfectly adapted even to the shape of the uterus and cannot descend without distending the inferior segment; this is seen particularly in forehead and shoulder presentations. An undis-

closed osseous dystocia may also condition a poor presentation. In these secondary anomalies the reaction by inhibition or true atony is rare; it is the contracture that one sees most often.

However, all of these anomalies of contraction due to various mechanisms have the same result: extremely slow progression and even arrest of dilatation—in inertia because of weakness, infrequency of contraction, lengthening of intervals; in the states of contracture, because of constriction, and stretching of all the uterine fibers; and, finally, in the states of hypertonicity, because of uterine retraction which constricts the fetus.

Physiopathological difficulties are manifest clinically in the following forms:

1. Functional insufficiency. This occasionally persists from the start to the finish of labor; it generally is modified in a eutocic sense or it is complicated by difficulties of malcontraction. This can be determined clinically or by graphic exploration. Indeed, when inertia exists in a pure state, one sees labor desperately prolonged. The contractures are feeble, of short duration, painful, placed far apart, even in spite of perfect engagement of the head and perfect conformation to the inferior segment. Labor can sometimes last for days if means for establishing a normal pace are not employed.

2. True muscular dystocia in labor. This is due to contracture. It can be mild or severe; it can involve the whole organ or can be localized in certain zones.

The states of mild contracture are observed in only particular circumstances: the membranes are generally intact and the uterine body struggles against the inferior segment which resists more or less. But little by little the weak musculature of the inferior segment and the neck give way before the pressure of the uterine body. The cervical canal opens passively either by pressure from the bag of waters or from the fetal prominence. That is the rule. But these are rare cases which one cannot foresee, in which the muscular elements of the cervical region resist longer and more abnormally in the course of the period of dilatation.

The clinical syndrome which indicates this struggle is also typical. The woman essentially has lumbar pain. On palpation the uterus is uniformly hard and this hardness persists a long time without relief. The heart sounds are muffled and the uterine souffle is exaggerated to auscultation. On touch the inferior segment is tight, resistant, and painful; often it is poorly formed. The neck can either remain thick when the presenting part is high or, on the contrary, soft when it comes in direct contact with the outlet, but at the moment of a contraction this is checked and it seems as though it were bounded by an iron band. This syndrome has received various interpretations, the most current one being an "active contraction of the uterine neck during labor."

Hysterographic films have shown that this cervical rigidity corresponds, in fact, to a state of uterine subcontracture. Indeed, a uterus does not contract except when it reacts in coming up against an obstacle to its dilatation. It is this obstacle, often not apparent, that one should look for.

In the cases of strong contracture the cause of arrest can be found in factors which alter the normal functioning of the neck or of the lower portion of the uterus. This can perhaps be an abnormal adherence of the membranous pole around the uterine outlet which prevents the normal progress of ablation of the inferior segment. A relatively simple procedure is to break these adhesions with the fingers or, better, to rupture the membranes. The inferior segment regains its elasticity and dilatation progresses rapidly. This condition may be called "agglutination of the neck", the origin of which one frequently finds to be an alteration of the neck by therapeutic caustics or endometrial inflammation. One recognizes this anomaly when it is difficult on vaginal examination to outline the orifice of the neck, especially when the thinness of the inferior segment, pressed tightly on the presenting part, reveals the existence of a complete dilatation. It is important to search carefully for the site of the depression (more or less distinct) which discloses the presence of the external orifice of the neck, then to introduce the tip of the index finger or a catheter so that the cervical obstacle can be lifted and the dilatation can progress rapidly.

There are indeed cases in which an excess of liquid, important because of the extreme distention that it can produce at the base of the uterus, deprives the inferior segment and the collar of all its pliancy. The artificial rupture of the membranes permits the uterine muscle to regain its normal contractility.

Sometimes one can find no apparent cause for the phenomenon of contracture, and authorities have shown the influence of antispasmodics which, administered at the onset of accidents, are capable of cutting down the cervical resistance and regulating the contractions. These ideas are significant from the point of view of treatment.

In addition to these phenomena of contracture due to a cervicosegmental obstacle easy to correct, there are others in which the obstacle is more serious and the contracture, if let alone, can assume a very grave character. The difficulties coincide generally with the onset of premature rupture of the membranes, but it is not this rupture which causes the difficulty. This anomaly of contracture is revealed by the clinical pace of labor. The pains are lumbar, and unremitting, continuing even through the intervals between contractions. The woman is seen to suffer even when the uterus is apparently relaxed. This impression corresponds, as was shown in the hysterographic curves, to an elevation of tonus to the level of the pain threshold in the intervening period.

However, the general syndrome which accompanies the painful phenomena is perhaps as typical as the pain itself. The women are agitated, complain constantly, vomit, and present a rapid pulse.

On palpation two syndromes can be observed:

1. Following sufficient labor, the presentation which was high has descended into the inferior segment; it strikes an obstacle there and progression

ceases. The uterus is contracted on the superior part of the fetus and presses itself upon it; it stretches the inferior segment. The permanent hardness of the muscle due to the contracture contrasts with the thinning by distention of the inferior segment.

2. The uterus, contracted from the outset, tightly binds the fetus over which it is molded. The inferior segment is malformed, the presenting part is high. The fetal head which is the agent of the transmission of forces, instead of progressing, remains completely imprisoned in the interior of the uterine cavity. The state of the uterine neck is variable to touch; sometimes the dilatation is very advanced, at other times it remains stationary at about 2 to 5 francs. When the fetus is entirely trapped in the contracted uterus, there is anywhere from a finger-tip to 10 cm. of the external orifice, and one can perceive the presenting part above the ring of stricture which marks the inferior limit of the corpus uteri.

When the head reaches the ring, it appears like a pendulum in the inferior segment, which it does not touch, and the shoulders are supported above the zone of strangulation; a sensation of unusual resistance occurs when one attempts a forceps extraction or an extraction with a basiotribe.

This state of contraction does not always persist; at a given moment the uterus may appear to relax. However, this relaxation is not much better for it denotes muscular fatigue. In fact, the hysterograph discloses a permanent elevation of uterine tonicity. If treatment is not given immediately the condition becomes much worse—in addition to hypertonicity capable of responding to agents modifying the uterine muscle fibers, there is a state of irreducible retraction, corresponding to histological lesions which in extreme cases appear as interstitial edema. This infiltration occurs not only at the neck but also more or less throughout the entire inferior segment. It is an edema which at first is soft and appears to harden somewhat as the syndrome evolves. On palpation it gives the sensation of leather filled with fat. Couvelaire has shown that the element of infection plays a considerable role not only in the appearance but also in the persistence of these cervical alterations. The contamination of frequent examinations, the suppression of the anti-infection barrier set up by the bag of waters, and the abnormal duration of labor after arrest of the presenting part explain the state of these alterations, easily confirmed by microscopic examination of specimens of the neck which show all stages from the leucocytic infiltration to microbic penetration. These anatomic lesions explain the almost absolute impossibility of the neck to dilate by normal mechanisms. The neck does not dilate—it ruptures. It is in these conditions that one sees transverse fissures or even a spontaneous circular amputation, and these accidents can progress to the point of uterine rupture or, at least, to favor serious amniotic infection.

The difficulties are inherent in the general etiologic conditions that have been studied. Indeed, behind these same contractures one usually sees two frequent causes: the congenital malformation and the irritation of the uterus provoked by a bad position or even by an irregularity of the fetal head, or sometimes by untimely intervention.

This irritability has been studied on a fresh specimen which was removed en bloc by hysterectomy. Uterine contraction is dependent on an autonomic intrauterine system as well as on the lumbar spine. In looking over the specimen the authors noted the presence of spontaneous intermittent contractile rings. The idea of opening the uterus and stimulating it with a stylet was conceived. When the irritation was intermittent it was seen that each time the tip of the stylet was touched to the muscle, circular contractions occurred, contractile rings starting at the periphery and converging toward the point of irritation. When the stimulus was continued, the uterine muscle froze, as it were, into a solid contraction (tetanic) which relaxed almost immediately on withdrawal of the stimulus.

The constriction rings occur at various levels of the body of the uterus. One sees them most often at the junction of the body and the inferior segment, more from autonomic than functional causes. In the habitual cephalic presentation this region corresponds to the furrow of the neck of the fetus.

In breech presentations the muscular constriction forms preferably at the level of the popliteal fold. In transverse presentations, when the head and shoulders are in the inferior segment, the ring can pass as a sling on the neck and the thorax of the fetus.

Clinically, the essential signs of the preceding form are the same as those found after premature rupture of the membranes: the same permanent character of the pain radiating to the lumbar region and, as in total contracture, the extreme slowness of labor with precocious appearance of the fetus.

Several clinical signs permit differentiation of these two forms. By inspection and palpation one can often discover a notch on the uterine margin which persists even during contracture, in fact this notch is usually discovered during intervention and the uterine wall forms a cul-de-sac above this notch. Reorientation of the fetal head usually corrects this situation; otherwise there is a rigid retraction which is of serious import to both mother and fetus. Two syndromes may be associated with this situation, either pure inertia or inertia with contraction.

It is emphasized that uterine atony and rigidity are always secondary, and the primary cause should be investigated from the standpoint of the uterus, pelvis, and fetus. The pelvis may have a narrow superior outlet or there may be a face presentation; in these cases a cesarean section is indicated. If dystocia is purely uterine, i.e., dynamic, medical management with antispasmodics is indicated. Membranes are ruptured when the dilatation has attained 4 or 5 cm.; then quinine or posterior pituitary extract may be used. In this way cervical resistance is abolished, and an easy intervention with an engaged head and complete cervical dilatation is possible. Anti-

spasmodics have been found to diminish the abnormal duration of hypercontractility and permit normal relaxation between contractures. Thus, severe uterine retraction with rupture, amniotic infection, endometrial gangrene, and peritonitis are avoided.

Among 61 cases reported, 47 physiological deliveries resulted following the use of antispasmodics. Thirteen cases resulted in intervention; 6 were forceps deliveries following cervical incisions anteriorly and posteriorly, 2 were spontaneous deliveries following cervical incisions, 2 were cesarean sections, and 3 were managed with the basiotribe. There were no maternal deaths, but 7 fetal deaths. It is concluded that antispasmodics have transformed the management of problems of dystocia. Results might have been better had intervention following the use of antispasmodics in some cases been earlier; the optimum time seems to be when the dilatation remains stationary after 21 hours, although fetal distress usually begins after 12 hours. Rupture of the membranes should be carried out when there is a permanent tension, when there is adherence of the inferior part of the fetus, or when no other reason for nonengagement has been found and the bag of waters rests on the cervical orifice. There should always be at least a 5-franc opening of the canal before rupture is attempted.

With regard to the use of antispasmodics, a first series of 2 or 3 injections of spasmalgine, at one-half hour intervals, is employed. This usually suffices to regulate the contractions and abolish uterine tonus without employment of a second series. If dilatation is stationary after ten hours, either cervical incision or section should be done. In primiparas, in the presence of a large fetus or after premature rupture of the membranes, intervention should be done earlier. PHILIP B. CHASE, M.D.

Reid, D. E.: The Treatment of Prolonged Labor with Extract from the Posterior Lobe of the Pituitary Gland. *Am. J. Obst.*, 1946, 52: 719.

Prolonged labor, dependent on uterine inertia and associated with cervical dystocia, is a syndrome occurring with rare exception only in primiparous women. Such exceptions are not due to cervical dystocia per se, and may occur in the "dangerous multiparas" with definite or borderline cephalopelvic disproportion. The author administered extract from the posterior lobe of the pituitary gland to 1,509 patients who exhibited any degree of uterine inertia during their labor. Uterine inertia exists when progress during labor ceases. The initial dose of this drug is usually 1 minim. The dosage is increased up to 4 minims at a single dose, at from 30 to 45 minute intervals in an attempt to stimulate uterine contractions. Usually cervical dilatation will ensue with the smaller doses. The total dose in a given labor is usually from 1 to 4 minims, but doses from 5 to 9, 10 to 15, and even of 15 minims plus were administered during a single labor.

However, if no effective uterine contractions or progress has been obtained after 1 to 4 minim doses have been used (which will cover a period of from 2 to 3 hours) it seems reasonable to discontinue the drug and turn to other means of completing labor. Procrastination from that point on will only add further hours of labor and an increased fetal mortality.

With the use of this drug there have been no cases of ruptured uterus or extensive birth canal trauma in this series. The incidence of prolonged labor has been reduced to the low figure of 2 per cent in the clinic patients. The need for midforceps operations in the clinic patients was reduced to 0.5 per cent. The need for Duhrssens' incisions was small. Some degree of intrauterine asphyxia accompanies normal labor. In this series it was 0.33 per cent.

Prolonged labor contributes materially to an increased fetal mortality. This is true particularly if the labor is more than 40 hours in length. Fetal mortality in the clinic patients with prolonged labor was 11.65 per cent, a figure which usually accompanies such cases. Intrauterine asphyxia was the most frequent cause of fetal death. JOHN R. WOLFF, M.D.

Mujica, H.: Internal Version in the Angel Custodio Sanhueza Maternity Hospital (La versión interna en la Maternidad "Angel Custodio Sanhueza"). *Bol. Soc. chilena obst. gin.*, 1946, 11: 57.

Among 15,153 deliveries over a 5 year period, internal version was performed in 422, or 2.78 per cent, of the versions, and was 3 times as common in the multiparas as in the primiparas. A comparison between the incidence of versions, forceps deliveries, and cesarean sections showed that versions were carried out in 2.78 per cent, forceps in 4.24 per cent, and cesarean sections in 1.24 per cent of the cases. Throughout the 5 year period the use of forceps increased and the use of versions decreased; the number of sections remained about the same.

Of the indications for versions, fetal distress accounted for 31.50 per cent, transverse presentation for 27.48 per cent, prolapse of the cord for 12.79 per cent, maternal exhaustion for 10.18 per cent, stoppage of labor mechanism for 4.97 per cent, prolapse of the superior extremity for 3.55 per cent, deflected cephalic presentation for 3.08 per cent, and twins, infection, excessive size of the fetus, dystocia of the cervix, and uterine rupture accounted for the remaining 3.31 per cent.

The complications which were seen following versions were as follows: perineal tears (22.51%), of which 18 per cent were 1 degree, 3.79 per cent of 2 degrees, and 0.71 per cent of 3 degrees; cervical tears (20.61%), vaginal tears (6.39%), vulvar tears (0.94%), tears of the lower segment (2.84%), hypertonicity of the uterus (6.16%,) uterine inertia (4.50%), retained secundines (7.34%), rupture of the cord (1.65%), transverse presentation of a second fetus (0.23%), retention of the aftercoming head (5.68%), locked arm (8.29%), anemia (2.60%), obstetrical shock (0.94%), and anesthetic syncope (0.23%).

The puerperal complications were as follows: simple endometritis (4.73%), purulent endometritis

(4.97%), infection of an episiotomy (2.60%), a febrile puerperium (0.47%), abscess of the abdominal wall (0.23%), putrid endometritis (0.69%), genital gangrene (0.47%), puerperal septicemia (0.47%), phlebitis (0.23%), subinvolution of the uterus (0.93%), anemia (0.47%), and late hemorrhage (0.23%).

Two-fifths of the patients with complications required the following treatment: repair of the canal (27.25%), placenta extraction (9.47%), dilatation and curettage (3.31%), colpotomy (0.23%), blood transfusions (1.65%), suture of the lower segment (1.65%), biopsy of the cervix (0.23%), delivery of the second twin (0.23%), forceps on the aftercoming head (0.23%), craniotomy (3.08%), and tamponade (0.46%).

Ether given by intravenous drip was used in 97.63 per cent of the cases.

The maternal mortality was 2.07 per cent and the infant mortality was 14.22 per cent; the morbidity was 25.35 per cent. ARTHUR F. CIPOLLA, M.D.

Kahanpää, V.: Cesarean Section with Special Emphasis on the Transverse Transperitoneal Incision (Ueber den Kaiserschnitt mit besonderer Beruecksichtigung der queren transperitonealen Schnittfuehrung). *Ann. chir. gyn. fenn.*, 1946, 35: 157.

This is a report on a series of 825 cesarean sections. The indications were contracted pelvis in 49.6 per cent, eclampsia and similar conditions in 19 per cent, placenta previa in 7.5 per cent, and others in 23.9 per cent. Three hundred and eleven of the women were subjected to the transverse isthmic section. A comparison of the longitudinal (cervicocorporal or isthmolongitudinal) and the transverse incisions shows that the latter is preferable; it is easier technically, the hemorrhage less, and the operation time shorter. There were also fewer postoperative complications. In no instance did uterine rupture occur in subsequent deliveries.

WERNER M. SOLMITZ, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Klein, J.: The Relationship of Maternal Weight Gain to the Weight of the Newborn Infant. *Am. J. Obst.*, 1946, 52: 574.

Most physicians who supervise prenatal care caution their patients against excessive weight gain during pregnancy. Their reasons for doing so are multiple. It is the opinion of many that the size of the fetus may thus be controlled. Prevention of overgrowth of the baby, especially in the presence of a pelvic contracture, would reduce the incidence of disproportion with its attendant hazards.

A series of 567 cases was studied statistically by the author to determine whether any relationship existed between the maternal weight gain and the weight of the newborn. In this group of cases, 408 primiparas and 159 multiparas were delivered of 282 male and 285 female infants. The heaviest baby weighed 10 lbs. and 7.25 oz. at birth; the lightest, 5 lb. and 4.5 oz. One mother who had lost 3.25 pounds during pregnancy gave birth to a girl weighing 5 lb. and 14 oz. The patient who had gained the most weight, 48.25 pounds, was delivered of a girl weighing 6 lb. and 5.5 oz. The average maternal weight gain for the series was 21.05 pounds, and the average weight of the newborn was 7 lb. and 6 oz.

No correlation was noticed between the maternal weight gain during pregnancy and the weight of the baby at birth. The average birth weight of the males exceeded that of the females. There is no relationship between the age of the mother, her weight gain during pregnancy, and the weight of the newborn infant. Although the average maternal weight gain and the average weight of the newborn of multiparas were greater than those of primiparas, the differences were slight and of no significance.

JOHN R. WOLFF, M.D.

NEWBORN

Repetti, M.: Fetal Erythroblastosis (Sull' eritroblastosi fetale). *Fol. gyn.*, Genova, 1946, 41: 3.

The author describes 2 cases of fetal hydrops, and 1 case of acute congenital icterus. In fetal hydrops the fetus is born prematurely as a stillbirth or dies immediately after birth. Heredity plays a part, and may alternate with successive deliveries of fetuses with icterus. The liver and spleen are enlarged, and there is an increased number of immature red blood cells and white blood cells. Foci of hematopoiesis in the liver, spleen, placenta, and other organs are evident. The amniotic fluid is increased in amount and has a yellow color.

Acute congenital icterus is often fatal and is characterized by a marked pallor of the skin with a short continuation of the intense jaundice. The liver and spleen are enlarged and focal embryonal hematopoiesis is revealed by masses of erythroblasts in various states.

Erythroblastosis of the newborn is characterized by an intense anemia, hepatomegaly, and splenomegaly, with increase of the nucleated red blood cells and reticulocytes. Foci of erythropoiesis are also seen.

Although these processes appear to be different, they are related. Fetal hydrops is the gravest, congenital icterus is intermediate, and hemolytic anemia of the newborn is the least grave condition. The incidence of these conditions is much higher than was formerly believed.

Other conditions which produce a similar picture and therefore must be considered in the differential diagnosis are as follows: syphilis, sepsis producing anemia, hemorrhagic disease of the newborn, congenital malformation of the biliary tract, and physiological icterus of the newborn.

Not only has the Rh factor been found as the etiological cause of these conditions, but the placenta is the route by which the antigens pass, although sensitization of the newborn may take place by intra-

muscular injection of Rh positive blood. The iso-anti-Rh antigen is also present in mother's milk and may sensitize the newborn by its ingestion through the intestinal tract; therefore this milk is contraindicated.

The treatment is transfusion with Rh positive blood and the administration of Vitamin K.

ARTHUR F. CIPOLLA, M.D.

MISCELLANEOUS

Spivack, M.: The Anatomic Peculiarities of the Human Umbilical Cord and Their Clinical Significance. *Am. J. Obst.*, 1946, 52: 387.

The author reports her observations of the anatomic peculiarities of the human umbilical cord. Twenty-five specimens were examined grossly for the presence of "valves," folds, and other peculiarities. Thirty were studied microscopically with special attention being given to the blood vessels. All these cords were from babies born alive. Cords from dead babies were utilized for the search of nerve tissue.

The umbilical vessels were found to differ anatomically from other blood vessels in several essential ways. True valves were not present. The presence of folds and nodules (nodules of Hoboken) were noted in the arteries and semilunar folds in the veins. The elastic tissue of the umbilical vessels varies from that seen in other vessels of similar size. The arterial media is strongly developed and its powerful contractions are ascribed by some authors to the spiral and snaillike course of its muscle fibers. Vasa vasorum and adventitia were not present. There is a delicate connective tissue which contributes to the sponginess of the vein.

The author demonstrates for the first time the presence of a nervous apparatus within the umbilical vessels.

Spivack points out the clinical application of the value of not ligating or tying the umbilical cord until its pulsation has ceased. She reviews the reports demonstrating the amount of blood that can be drained from the placenta into the fetus by adopting this dictum, and reasons that this occurs because the anatomic peculiarities of the umbilical vessels are such that the arteries have greater contractile power than the veins and compression of the placental vessels will lead to a contracting, narrowing, and obliteration of the arterial cord, with an increase or dilatation of the umbilical vein. Thus the outflow of the blood from the baby to the placenta is hindered while the return flow is augmented.

JOHN R. WOLFF, M.D

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Söderlund, G.: Four Cases of Tuberculosis of the Kidney. *Acta chir. scand.*, 1946, 94: 470.

Four cases of renal tuberculosis are reported by the author because they are interesting from the standpoint of diagnosis, indications for operation, or pathological findings.

A 42 year old man was operated on in 1930 for a rather extensive hydronephrosis of the left side of a horseshoe kidney. Pyelolithotomy was performed. In 1944 an extensive tuberculosis of the right half of the kidney was diagnosed. The involved portion was removed and the patient was discharged cured.

In a 20 year old girl tubercle bacilli and pus were found in the urine, and urographic studies revealed an extensive tuberculous process in the left kidney and also a few irregular cavities in the right kidney, considered to be also of a specific character. Two years later the urine from the right kidney appeared to be normal and the cavities in the involved kidneys were no more visible after retrograde pyelography. The tuberculous left kidney was removed and the patient was discharged cured.

In a woman, age 45, with cystitis of 3 years' duration the urine was found to contain pus and tubercle bacilli. Urography revealed an extensive tuberculosis of the right kidney and a rather large hydronephrosis of the left kidney. The urinary bladder was contracted. The nonprotein nitrogen was 100 mgm. per cent. After insertion of a retention catheter the nonprotein nitrogen gradually diminished to 36 mgm. per cent. The tuberculous right kidney was removed and the bladder gradually expanded.

A woman, age 35, had had periodic attacks of fever without local symptoms for 10 years. Urography and urine examination failed to disclose any pathology of the urinary tract but 3 years later a congestion of the upper pole of the left kidney and a displacement of this kidney downward and in a lateral direction were found. Nephrectomy was performed and a large cavity was found in the upper half of the removed specimen. Colon bacilli were demonstrated in the pus of the cavity which was not communicating with the renal pelvis. The histological examination disclosed the presence of tuberculosis. The patient made an uneventful recovery.

JOSEPH K. NARAT, M.D.

LeComte, R. M.: Perinephritis and Perirenal Abscess. *J. Urol.*, Balt., 1946, 56: 636.

The author's study is based on records of 28 patients, which contain fairly complete data. They have been culled from some 9,600 odd cases of real or suspected urologic disease encountered over a period of 25 years, an incidence of about 0.3 per cent.

Eleven of the 28 patients were in the primary or uncomplicated group; all of these recovered. Eight of the 17 patients with secondary or complicated disease, died, a percentage of 46.5 per cent. The mortality for the entire group was 28.5 per cent. All of those who died had renal infection which, in 2, probably originated from prostatic obstruction; in 1 patient the abscess probably developed as a result of extension from a ruptured posterior urethra torn in a poorly performed internal urethrotomy; in 1 patient there was a left renal stone and acute bilateral pyelonephritis with multiple small abscesses; in 1 patient, following puerperal sepsis, the condition was discovered at autopsy, and a pelvic as well as a perirenal abscess was found; 1 patient had active pulmonary and renal tuberculosis. The 2 other patients who died had acute renal infection of undetermined anatomic origin. The former died from sepsis and shock following the too thorough exploration of an infected kidney in searching for a stone; the latter died from pulmonary tuberculosis. The time intervening between operation and death varied from 1 day to 3 months. All but 2 of the 17 patients with secondary cases (1 with vertebral disease and 1 with appendical abscess) had urinary infection of some sort, ranging from hydronephrosis with or without stone and obstruction, to prostatic abscess, urethral strictures, etc.

On x-ray, a mass was observed in 6 of 10 patients. The spine was concave towards the side of the abscess in 7 patients, and convex in 1 of the 10 in whom this finding was set down. The psoas shadow was obliterated on the involved side in 6 patients, on both sides in 1 patient, and was indistinct in 1 of 8 patients. The pyelogram was recorded in 13 cases; the kidney was considered to be normal in 6; was reported as deformed without characteristic change in 2; as showing evidence of external pressure in 3, and of hydronephrosis in 2 patients, each of whom had ureteral obstruction. The kidney was displaced laterally in 2, and mesially in 2 of 4 cases. It was fixed in 1 of 2 instances in which this feature was checked.

The multiplicity of possibilities as to pathogenesis and mode of invasion has led to a somewhat confusing classification and terminology, based on points that often cannot be determined with certainty even at operation or autopsy. The author's preference is to consider the basic lesion as a perinephritis, nonsuppurative or suppurative, and to designate the suppurative form with definite abscess formation as perirenal, despite the objectionable impure composition of the word (Simeone). This avoids the confusion due to the similarity in spelling and sound of the words, perinephritic and perinephric.

Bacteria may reach the perinephrium by metastasis or, as heretofore set forth, by extension from inflamed nearby organs. A perirenal abscess may occur from metastasis, too, if a hematoma from traumatism has occurred in the perinephrium and if bacteria circulating in the blood lodge and multiply in it. The point of origin is immaterial if renal or other complicating

lesions are suspected and sought in every case, and treated if found (Ockerblad). In the primary cases staphylococci are usually the inciting organisms, while streptococci or colon bacilli occur in the secondary ones, and tubercle bacilli in those secondary to renal tuberculosis.

When exposed, the entire fatty layer or parts of it may be found to be hardened, edematous, hemorrhagic, and inflamed, without any macroscopic evidence of frank suppuration, or pockets of pus of varying sizes may be found well distributed throughout the layer. The entire perinephrium may be distended with pus, the kidney being surrounded by it on all sides. The variable gross pathologic pictures encountered probably represent different stages of a single pathologic process. Histologically, the inflammatory reaction occurs mainly in the septa or supporting fibrous tissue.

The dominant symptoms of perinephritis are sepsis, lumbar pain, or tenderness and lumbar mass.

Fever is generally high and may be of any type. Remittent or intermittent fever is usually present in the earlier stages. Remissions or intermissions of fever may be accompanied by a decrease in the flank pain and tenderness; these may be due to the extension or rupture of an abscess into a new uninvolved area of the loose fat so that tension in the infected locus is lessened and absorption is, for a time, diminished. Intermissions may be accompanied by chills. Continuous fever usually occurs in large abscesses or in those that are complicated by involvement of the nearby organs.

The leucocyte count is usually high, both relative and absolute. Pain is usually present and is located in the flank or abdomen of the side affected. It is generally dull and indefinite in character and seldom differs distinctly from pain due to other flank lesions of various sorts. The pain generally may be reproduced if absent, or increased if present, by pressure over the superior lumbar triangle or over the mass itself, if one exists.

Lumbar mass may be present early if the abscess is at the lower pole, well below the ribs, but if it is behind the kidney or near the upper pole, no mass may be perceptible, even in well advanced cases, because the rigid lower part of the costal cage renders it inaccessible to palpation.

In abscess of extrarenal origin the urine is generally normal except for toxic albuminuria and cylindruria. In the intrarenal group pus, albumin, and bacteria are generally present; the function of the kidney on the involved side may or may not be diminished. If a patient with sepsis has a normal urine, but has neither renal pain nor flank tenderness, no suspicion of perirenal disease may be aroused unless a palpable mass develops or the shadow of one is detected on x-ray.

No x-ray or urographic sign is altogether characteristic of perirenal abscess. Yet if the x-ray findings are assembled and correlated with the clinical symptoms and signs, they may amplify the study so that the diagnosis of abscess may be made with considerable confidence.

The plain x-ray may show a mass, obliteration of the psoas or lumbar scoliosis, with the concavity toward the affected side; urographic study may reveal deformities of the kidney pelvis, and fixation and displacement of the kidney or ureter.

Obliteration of the psoas shadow (Lipsett-Beer) on the affected side is due in part at least to increased radiopacity of the inflamed contents of the renal fascia and is generally associated with the presence of a mass on x-ray.

Scoliosis of the lumbar spine with concavity towards the affected side (Beer) is ascribed to contraction of the longitudinal muscles of the spine so as to splint the trunk and thus afford relief from the pain induced by compression of the enlarged tense perirenal mass.

The pyelogram itself may be normal or may present irregularities or deformities in perinephritis both with or without abscess. In the primary variety, the pyelographic changes are neither constant nor of great significance. Displacement of the kidney or ureter may be revealed by pyelography. Lateral shifting may be shown in the anteroposterior film.

Fixation of the kidney may be demonstrated. Separate pyelograms, one taken with the patient at full expiration and a second at full inspiration and straining, or with the patient standing, may demonstrate this feature.

The symptoms and signs of perinephritis are so variable that no precise formula for diagnosis can be adduced. There is really no pathognomonic sign of perinephritis short of opening the loin and finding an abscess or an inflamed tunica adiposa with the fascia of Gerota. For practical purposes of treatment, however, it is ordinarily sufficient to demonstrate the need for surgical incision of the loin and the absence of complicating diseases which may require more urgent attention than does the perinephritis itself. Diagnostic puncture may be done but its value is questionable.

The treatment is essentially surgical, drainage being indicated as soon as the diagnosis of abscess is made. Only exceptionally will a patient whose sepsis has existed for more than a few days be found who has not had some one of the sulfonamides or penicillin administered. It has been suggested that the failure of sepsis with flank symptoms to yield to adequate sulfonamide therapy may be considered presumptive evidence of abscess; diagnoses by this means, of abscesses considerably smaller than those usually encountered, are reported. Primary perinephritis, diagnosed before abscess formation, is reported to have cleared up under penicillin therapy (Prehn). In one of the author's patients in whom penicillin therapy had been used, no macroscopic abscess was found at operation but the entire tunica adiposa was hard and hemorrhagic; recovery occurred without the further use of penicillin. Penicillin failed to control the symptoms in another patient and an abscess was found at operation.

If pus is encountered on opening the renal fascia, the cavity should be explored thoroughly but gently and carefully so as to locate and open secondary pockets without encouraging spread of infection by marked-

ly disturbing the abscess wall. Failure to drain secondary abscesses may lead to delayed healing which will require a second operation.

If no frank pus is encountered, and the perirenal fat is found to be hard and hemorrhagic, a thorough exploration of the perinephrium should be done, especially behind and at the upper pole of the kidney.

If a renal lesion is known to exist beforehand or is found at operation, it is generally better to be content with drainage of the abscess, especially if the patient is markedly septic, leaving the primary renal difficulty to be cared for later. A secondary nephrectomy is often difficult and somewhat hazardous but is perhaps less dangerous than the spreading of infection from extensive handling of a kidney in the presence of extensive suppurative perinephritis.

JOHN A. LOEF, M.D.

Munger, A. D.: Renal Surgery. *J. Am. M. Ass.*, 1946, 132: 675.

The author urges greater conservatism in renal surgery. Too often the kidney is sacrificed when it can be readily saved by a conservative procedure. Conditions for which nephrectomy is performed are frequently limited to only a small portion of the kidney substance. Resection of only the diseased portion of the organ is the preferable procedure.

In the hands of many surgeons, the only operative procedure for hydronephrosis is nephrectomy. Surgical correction is for the most part a perfectly logical and feasible operation. Protective splinting with adequate and prolonged intrapelvic drainage is an absolutely necessary procedure in plastic correction of the renal pelvis.

Hydronephrosis is not uncommonly a bilateral disease, and the removal of a kidney for hydronephrosis is not infrequently followed by the development of a hydronephrosis on the opposite side.

About 70 per cent of diseases requiring surgical intervention, and congenital in origin, are amenable to conservative surgery. Total nephrectomy for hydronephrosis should be performed only when it has been demonstrated that the drainage system of the kidney is completely destroyed and beyond recovery.

When ischemia occurs in a greatly altered area of renal tissue as a result of ligation of a renal vessel to relieve pyeloureteral obstruction, the author recommends resection of the ischemic area to prevent septic necrobiosis.

If the urinary passages are opened in a partial resection, prolonged drainage of the pelvis is indicated to prevent fistula formation.

FREDERICK A. LLOYD, M.D.

Ortega, F. E.: Indications for Nephropexy (Las indicaciones de nefropexia). *Arch. espań. urol.*, 1946, 3: 174.

The mere existence of an abnormally movable kidney does not constitute an indication for nephropexy unless there is interference with pyeloureteral evacuation. Alterations in the region of the kidney can be easily detected with pyelograms. All authors generally agree that without a specific indication, nephropexy should not be performed as a supplementary operation after pyelotomy or nephrotomy. Pyelograms should be taken in the horizontal as well as in the erect position of the patient. Serial, cinematographic pictures may furnish valuable information. Pyeloscopy, as advocated by Legueu, has not found many adherents.

Even if the kidney can be palpated and the patient complains of pains in the renal region, conservative treatment is advisable if pyelographic findings are negative. In some cases the decision is difficult to make. In many instances in which torsion of the ureter by a ptotic kidney is suspected, dilatation of the renal pelvis supplemented by proper medication, rest, and a dietary regimen, may furnish relief. Nephropexy may easily be discredited unless strict indications are observed. JOSEPH K. NARAT, M.D.

BLADDER, URETHRA, AND PENIS

Castro, E. P.: Vesicoureteral Reflux (Concepto actual del reflujo vésicoureteral). *Arch. espań. urol.*, 1946, 3: 122.

Vesicoureteral reflux in the majority of cases must be considered as a phenomenon caused by a defective synergism of ureterovesical dynamic factors. Such conditions may be created by an irritation of the muscular layer of the urinary bladder and an alteration or retardation of the transmission of reflexes which is responsible for alternating tonokinetic phases of the bladder and ureters

According to extensive questionnaires, a reflux is observed in cases of malignant but not benign lesions of the bladder. This may be explained by the assumption that malignant neoplasms create special reflexes. The author's experience does not correspond to that mentioned in the statistics as he observed a vesicoureteral reflux also in cases with noninfiltrating neoplasms.

Hypertrophy of the prostatic gland was not considered as an important factor in the creation of the vesicoureteral reflux until the introduction of cystographic studies. As a matter of fact, reflux occurs in from 4.7 to 18 per cent of all cases of prostatic hypertrophy. The mechanism of production of such reflux has not been completely elucidated but the increased intravesical pressure seems to be an important factor. In addition to such passive factors as mechanical obstruction, an active factor in the form of a disrupted ureterovesical synergism enters into play.

An obstruction of the neck of the bladder may be responsible for the origin of a diverticulum of the bladder and also for a concomitant reflux.

A frequent coexistence of vesicoureteral reflux and tuberculosis of the excretory organs has been observed. A transurethral resection of the neck of the bladder performed at an early stage of the condition may relieve the reflux accompanying tuberculous cystitis.

The author reports 19 cases of ureterovesical reflux.

JOSEPH K. NARAT, M.D.

Molina, L. R., and Estarellas R.: Instrumental Trauma following Cystostomy (Herida instrumental en un cistostomizado). *Rev. argent. urol.*, 1944, 13: 241.

As the first stage of the surgical treatment of an adenoma of the prostate gland, a cystostomy was done on a 27 year old man. One month after the operation the family physician tried to eliminate an obstruction of the drain. The patient experienced severe pain and the following day was admitted to the hospital. The examination showed that fecal matter, not urine, was escaping from the drain and between the drain and the wall of the fistula. Three hundred cubic centimeters of clear urine were evacuated through a urethral catheter. The bladder was irrigated with a solution of mercury oxycyanate, but the injected liquid did not escape through the hypogastric drain. This observation proved that the bladder was occluded and that the drain in the hypogastric region was communicating with the intestines and not the bladder. The drain was withdrawn, and a curved probe was introduced through the urethra and brought out through the suprapubic fistula. A retention catheter was placed into the cystostomy opening. An antiseptic solution injected through the urethral catheter escaped through the Pezzer catheter.

After insufflation of the urinary bladder with air and the injection of an opaque medium, the relations between the cystostomy, the bladder, and the small intestines were visualized by means of roentgenograms. Apparently an adhesive plastic peritonitis was responsible for the connection between an intestinal loop and the anterior wall of the bladder. The circumscribed peritoneal reaction apparently prevented more serious complications.

JOSEPH K. NARAT, M.D.

Pierini, A.: Traumatic Rupture of the Bladder and Posterior Urethra. Four Observations (Ruptura traumática de la vejiga y uretra posterior. A propósito de 4 observaciones). *Bol. Acad. argent. cir.*, 1946, 30: 1084.

The author reports 4 cases. The first was that of a man who sustained a fracture of the left iliopubic and ischiopubic branches of the pelvis, which led to a rupture of the posterior urethra. The second was that of a woman with a vertical fracture of Malgaigne's type with extraperitoneal rupture of the bladder. The third patient was a 15 year old boy with a fracture of the pelvis and signs of an extraperitoneal tear of both the bladder and the posterior urethra. The fourth patient, a man 37 years old, also had an extraperitoneal tear of both organs, which had been caused by a fracture of the pelvis.

Extraperitoneal rupture of the bladder usually involves its anterior aspect but occasionally the trigonum or the posterior portion may be torn. Such injuries are usually the sequelae of a fracture of the iliopubic or ischiopubic bone or separation of the pubis. One of two mechanisms may be responsible for such complications, namely a perforation of the wall of the bladder by osseous spiculae or a tear caused by violent traction exerted by the pubovesical ligaments. A combination of both mechanisms may take place, in some cases, causing multiple perforations at times.

Instead of a complete tear of the bladder wall, a partial rupture or so-called contusion of the bladder may occur. A unilateral or bilateral iliopubic or ischiopubic fracture, a double or quadruple vertical fracture of Malgaigne's type, or a pubic or sacroiliac separation may cause brisk traction on the median aponeurosis of the perineum and a complete section of the urethra in a manner similar to the mechanism of a guillotine. Sometimes a fragment of a bone may pierce the urethra. The accompanying hemorrhage is caused by a tear of Santorini's venous plexus and the deep dorsal veins of the penis. The blood infiltrates the Retzius' cavity and the ischiorectal fossa and produces ecchymoses in the perianal zone.

A traction exerted by the pubovesical ligament and the median perineal aponeurosis may cause a simultaneous rupture of the bladder and the posterior urethra as was the case in 2 patients reported by the author.

The injection of air instead of a contrast medium for cystography may be advantageous for diagnostic purposes.

As to treatment, early exploratory laparotomy is indicated whenever a fracture or dislocation of the pelvis is accompanied by hematuria. The majority of authors, including the writer is opposed to Boehler's suggestion to treat intraperitoneal as well as extraperitoneal ruptures of the bladder by complete suture of the tear in the bladder and the skin without drainage. Supposedly, the skin suture prevents infection of the extraperitoneal hematoma. The introduction of a retention catheter is the final step of the operation. Although in the author's opinion this procedure may be admissible in certain cases of intraperitoneal rupture which are treated early, it is an undesirable method in extraperitoneal rupture of the bladder as it may have grave consequences. Suture of ecchymotic margins of the wound which may appear viable at operation may lead to postoperative disruption. Furthermore, occlusion of the retention catheter by a blood coagulum may be followed by urinary infiltration of the soft tissues. The author advocates a cystostomy, the introduction of Pezzer's catheter, and a local application of sulfonamides. A drain may be introduced into the Retzius cavity. The bladder is not attached to the abdominal wall.

Some writers advocate a reconstruction of the posterior urethra in case of rupture as soon after the accident as possible, while others recommend a cystostomy to be followed by a secondary reconstruction of the urethra after the fracture has healed. In selected cases the first method may be acceptable, but as a rule the second is preferable. If a rupture of the urethra is combined with a tear of the bladder, a primary cystostomy is the method of choice.

JOSEPH K. NARAT, M.D.

Tahara, C., Lechner, C., and Hess, E.: Acute Interstitial Cystitis. *J. Urol.*, Balt., 1946, 56: 535.

The authors report 3 cases of a new clinical entity which, for want of a better name, they have called acute interstitial cystitis. Each case presented approximately the same subjective syndrome, namely, marked urinary frequency, strangury, and the passage of bloody urine.

The urograms in each case revealed a contracted bladder, and overdilatation of the ureters and pelves of the kidneys. The picture resembled that seen in tuberculosis, malignancy, and chronic interstitial cystitis. The condition is inflammatory and can be cured by large doses of penicillin and by arsenicals. The prognosis is good, but recurrences have occurred.

FREDERICK A. LLOYD, M.D.

Flocks, R. H.: Carcinoma of the Bladder. *Canad. M. Ass. J.*, 1946, 55: 348.

From 1930 to 1942, 540 cases of carcinoma of the bladder (0.5 per cent of all cases and 5 per cent of all urological cases) were seen in the University Hospitals, Iowa City, Iowa. The majority of patients were in the age group between 50 and 80 years. Metastases were found in 4.1 per cent of the total number of cases. The most frequent presenting symptoms were hematuria and bladder irritation.

Tumors were classified into three main types: (1) papillary tumors; (2) infiltrating tumors confined within the bladder wall; and (3) infiltrating tumors extending through the bladder wall. Differentiation was made on the basis of the cystoscopic appearance of the tumor, the microscopic appearance of portions of it, and bimanual palpation under spinal or other anesthesia.

Of 168 patients whose tumors were considered papillary, 167 underwent transurethral resection. Eleven died of the operation. The disease was controlled in 130 patients. Twenty-three died or are dying of their disease. Three could not be followed up. One patient who was fulgurated suprapubically died postoperatively of a urinary tract infection.

There were 249 patients with infiltrating tumor which was considered to be confined to the bladder wall. In this group, 126 were treated by transurethral resection alone, with control of the disease in 67. Seventy-four were treated by transurethral resection combined with deep x-ray therapy, with resulting control of the disease in only 23 cases. Forty-nine patients received treatment other than transurethral resection alone or combined with x-ray therapy. Five of 13 cases were controlled by partial cystectomy. One of 16 is known to be controlled by suprapubic fulguration. None of 6 cases receiving x-ray therapy alone was controlled. One patient underwent transurethral implantation of radon seeds without benefit. One underwent suprapubic implantation of radon seeds and is doing well. Two patients underwent total cystectomy and are doing well; however, 3 patients died from complications of urinary diversion procedures preliminary to contemplated total cystectomy.

Transurethral resection was found to have definite palliative value in cases deemed incurable.

The author concludes that transurethral resection is an excellent method of treatment in approximately 50 per cent of cases of carcinoma of the bladder. Earlier diagnosis should increase the percentage of good results. This implies increased awareness on the part of physicians to the possible significance of hematuria and bladder irritation.

In cases not amenable to transurethral resection, i.e., all adenocarcinomas and all tumors with extensive infiltration, total cystectomy offers the greatest chance of cure, but its value is limited by the mortality associated with procedures necessary for urinary diversion. The author proposes a new method, soon to be reported, by which he believes the mortality can be lowered.

CLARENCE V. HODGES, M.D.

Gorro, A. P.: Total Cystectomy (La cistectomía total). *Rev. españ. cir.*, 1946, 3: 197.

In the author's opinion total cystectomy represents the only correct method of treatment of cancer of the urinary bladder. In this respect, cystectomy may be compared with gastrectomy, which procedure is not disputed by anybody as the method of choice for the treatment of gastric cancer. The final results of total cystectomy may be even better than those of gastrectomy because a cancer of the bladder can be diagnosed at an earlier stage. On the other hand, from the social point of view gastrectomy can be tolerated more easily than the mutilating removal of the urinary bladder which necessitates deviation of the urinary flow. Frequently, total extirpation of the bladder is not selected by the surgeon because the lesion is circumscribed, but in reality the radical operation gives the best promise at that stage and carries a relatively small risk because of the good general condition of the patient.

There are four methods of diverting the urinary flow after total cystectomy: (1) transplantation of the ureters into the intestines, namely the colon or rectum; (2) implantation of the ureters into the hypogastrium; (3) implantation of the ureters separately into the iliac fossae; and (4) implantation of the ureters into the lumboiliac regions.

Attempts to create a new receptacle for urine out of an isolated loop of the intestines never became popular. The multiplicity of methods for deviation of the urinary flow proves that none is quite satisfactory and applicable in every instance. On the other hand, there is a unanimity of opinion as to the operative procedures concerning the extirpation of the bladder; either the abdominal or the abdominoperineal approach is used, in accord with the local conditions.

As a rule, implantation of the severed ureters into the skin is preferable to their implantation into the intestines. In many cases it is advisable to perform such an operation as the first stage of the entire procedure in order to improve the renal function and the general condition of the patient. The author does not approve of exploration of the lymph system in

the pelvis, lumbar region, and along the aorta in order to extirpate the invaded ganglia, because when the condition is so far advanced, extirpation of the bladder is no longer indicated. Symphysiotomy is contraindicated in view of the danger of infection of the bone. As a rule, the author employs a low median incision. If the perineal approach is selected, the author starts with the perineal incision and detaches the prostatic gland and the seminal vesicles from the rectum.

Every effort should be made to preserve the ureters which can be easily traumatized, especially during the separation of the posteroinferior aspect of the bladder. If a considerable portion of the ureters is damaged, great difficulties may be encountered in implanting them into the skin.

Trendelenburg's position is used for the operation. The vasa deferentia are ligated and the vascular pedicles are isolated and tied proximal to, and in front of, the ureterovesical junction. In women an inverted V-shaped incision is carried through the anterior vaginal wall, surrounding the external meatus of the urethra. The urethra can then be dissected up to the internal meatus. One or two rubber drains are inserted into the perineal wound in men. If the ureters are long enough, both are implanted into the skin through a stab wound close to the midline. Each ureter is attached to the skin with four sutures placed through its muscular layer and adventitia. If the ureters are not long enough to reach the midline, they are implanted in the iliac fossa in the vicinity of the anterior superior iliac spine.

Forty-eight hours after the operation the gauze sponges are removed from the hypogastric incision, while from the perineal wound they are extracted after 4 or 5 days. The rubber drains are withdrawn from the perineal wound 2 or 3 days later and are replaced by smaller ones. These drains prevent the formation of pelvic cellulitis which represents the most serious complication of the operation.

JOSEPH K. NARAT, M.D.

GENITAL ORGANS

Fergusson, J. D.: Carcinoma of the Prostate Treated with Estrogens. *Lancet*, Lond., 1946, 2: 551.

Fergusson carried out repeated biopsies on 9 patients with carcinomatous prostates and accessible metastases in suitable cases during continued estrogen therapy, and simultaneous estimations of acid phosphatase content of the affected tissues. All the patients had proved prostatic cancer and showed a good clinical response to estrogens. Fergusson used a Thompson resectoscope, and the tissue was removed from behind the posterior quadrant of the urethra above the verumontanum. The biopsy intervals varied from 10 days to 23 months.

The estrogen employed was stilbestrol or dienestrol in doses of from 2 to 15 mgm. daily. In nearly all of the cases the neoplasm regressed from a glandular adenocarcinomatous to a less cellular scirrhous form. In some cases a measurement of the nuclear diameter and computation of the tumor units were made and a definite decrease in number and size under therapy was revealed. The fresh biopsy material was stained for acid phosphatase, and again the concentration of the enzyme diminished during treatment. There was no intimate connection between the concentration of acid phosphatase in the affected prostate and the amount in the blood serum. The serum value is undoubtedly derived from the quantity elaborated by the metastases as well as by the primary growth.

Serial removal of several involved lymph nodes in 1 patient demonstrated regression of the metastasis also. The author observed nipple tenderness, mammary swelling and pigmentation of the areola, shrinkage of the testes, changes in complexion, and vertigo in 66 per cent of the treated patients. The average survival period of 23 patients treated with estrogens was longer than that of 27 patients not so treated. About half of the deaths were due to delayed and often sudden reactivation of the tumor, as though sensitivity to the estrogen was abruptly lost. In the present state of our knowledge, it appears that estrogen treatment should be used early and continuously. DAVID ROSENBLOOM, M.D.

McCrea, L. E.: Carcinoma of the Prostate; A Résumé of Treatment with Ethinyl Estradiol. *J. Urol.*, Balt., 1946, 56: 697.

In its chemical structure, ethinyl estradiol is closely related to alphestradiol, the natural follicular hormone. It does not lose its potency upon oral administration. It is considered to be the most potent oral estrogen used up to the present time, being 6 times more potent than diethylstilbestrol.

The author makes an attempt to contrast the length of survival period, the disappearance of symptoms, and the end-results for a larger but untreated series, with a smaller but nonetheless typical series in which orchectomy and estrogenic therapy were instituted.

In his series of 15 cases subjected to the combined therapy of orchectomy and estrogenic therapy, ethinyl estradiol was used instead of diethylstilbestrol. The dosage schedule routinely employed was a 30 day period in which 0.05 mgm. ethinyl estradiol was given once a day, alternating with a 30 day rest period. One patient has been on such a regime for 27 months. The results attained were good, and more than favorably compared with the results attained with diethylstilbestrol, and warrant the further use of the drug.

An attempt was made to use the fall of the serum acid phosphatase level as an index of therapeutic efficiency, but it was not uncommon to find the original level within normal limits; in these cases the diagnosis was made on clinical interpretations alone. It cannot be stated that a low primary level or a marked regression of the level should be a criterion in estimating the prognosis, extent of metastases, or severity of pain.

The author found regression of the prostate to be remarkable in most instances. In his series of 15 cases

not a single transurethral resection was necessary after the institution of combined therapy, although many of the patients were in a state of acute urinary retention when first seen.

The side effects of ethinyl estradiol therapy were similar to, but less intense than those seen following the use of diethylstilbestrol. The use of vitamin B complex is suggested to relieve such side effects as exist. The breasts may become grossly enlarged and are sometimes painful, but this is less marked than with diethylstilbestrol. Edema of the lower extremities was slight in this series, and in not a single instance did it become necessary to discontinue the drug.

The author concludes that the side effects of ethinyl estradiol are not as severe as those of diethylstilbestrol, and that subjective improvement always followed its use. JOSEPH E. MAURER, M.D.

Nixon, N., and Lewis, D. B.: Mumps Orchitis. *J. Urol.*, Balt., 1946, 56: 554.

Epididymo-orchitis, occurring in mumps, is responsible for long periods of hospitalization. Important to the patient is the possibility of atrophy of the involved testicle with subsequent sterility and impotence. Most authors report an incidence of testicular atrophy of between 40 and 60 per cent. Orchitis usually occurs before complete subsidence of mumps parotitis. In rare instances it may precede the parotitis by a number of days and in other cases it may be the only manifestation of mumps.

The temperature usually rises shortly before the patient begins to complain of testicular tenderness. As swelling occurs the fever rises, sometimes to 105°F., and the patient complains of chilliness, backache, malaise, nausea, and vomiting. The testicle becomes hard, smooth, exquisitely tender, and remains so for at least 4 or 5 days. The fever then drops by lysis, and the swelling subsides, the usual course of the orchitis taking about 10 days.

The invasion of the glandular tissue by the virus causes an edema of the former which is restrained by the firm, fibrous, tunica albuginea. In fulminating cases, hydrocele fluid accumulates between the tunica albuginea and the tunica vaginalis. This causes pressure necrosis of the seminiferous tubules with subsequent partial atrophy of the testis.

The shift in the blood picture from leucopenia and lymphocytosis to polymorphonuclear leucocytosis is further evidence of necrosis.

The medical treatment of orchitis is symptomatic. Convalescent serum, hot and cold applications, and drugs are useless.

The author advocates the treatment of severe orchitis by surgical drainage. An incision, 2 cm. long, is made over the anterior surface of the scrotum under 2 per cent procaine infiltration anesthesia, and the tunica vaginalis is incised. Usually the hydrocele fluid drains out under considerable pressure. A small Penrose tube is inserted beneath the tunica vaginalis, and the wound is closed.

Of 339 soldiers with mumps at an Army Air Base, 101 (nearly 30%) developed orchitis. In 68 of these (67%) the orchitis was sufficient to warrant surgery. In 66 soldiers, the above described technique was employed. In 2, the tunica albuginea was also incised by the technique of Wesselhoeft and Vose. Drainage was maintained for at least 24 hours.

Most patients showed almost immediate improvement with relief of pain, nausea, vomiting, and headache within a few hours, and reduction of the swelling within 24 hours. It was possible to follow up 27 of these patients; 26 revealed no evidence of testicular atrophy other than a slight degree of softening of the testicle in comparison with the firmness of its fellow. FREDERICK A. LLOYD, M.D.

Baker, W. J., and Ragins, A. B.: Actinomycosis of the Testicle. *J. Urol.*, Balt., 1946, 56: 547.

A case of actinomycosis of the testicle in a 77 year old man is described as an incidental finding in a bilateral orchectomy for the treatment of carcinoma of the prostate gland. The tunica vaginalis of the right testicle was loosely adherent to the tunica albuginea, and the testicle measured 5 by 3.5 by 3 cm. The surface made by cutting was brownish gray and studded by numerous abscesses which were filled with a greenish gray purulent material emitting a musty odor. The right epididymis showed no gross abnormal findings.

Since gross examination gave no clue as to the true nature of the condition, the specimen was fixed before cultures were taken. The diagnosis of actinomycosis became obvious after microscopic studies. Because of the typical radiating fungus with bulbous mycelia at the periphery, the organism may be considered as actinomyces bovis (Wolf Israeli type).

The condition is extremely rare. This represents the fourth case to be reported in the literature.
FREDERICK A. LLOYD, M.D.

Friedman, N. B., and Moore, R. A.: Tumors of the Testis; Report on 922 Cases. *Mil. Surgeon*, 1946, 99: 573.

In a group of 922 cases of tumor of the testis occurring in males of military age who were serving in the Army of the United States, the authors found that 96 per cent of these tumors could be classified into 4 fundamental structural patterns. These were: seminoma (35%), embryonal carcinoma (19%); teratoma (7%), and teratocarcinoma (35%). Of the remaining 4 per cent, 1 per cent were interstitial cell tumors, and the remainder fell into a miscellaneous category.

Seminomas showed, mainly, a homogeneous monocellular pattern. They were composed of sharply defined, rounded polyhedral elements; the cytoplasm was often clear. The nuclei, clearly outlined, were centrally placed, as were the nucleoli. The nuclear chromatin was evenly dispersed. The cells were remarkably uniform and were usually arranged in unorganized masses, separated by trabeculae of connective tissue. Occasionally the arrangements of cords and columns gave the impression of glandular structures, but no lumens were formed. Micro-

scopically, they appeared relatively benign, which appearance was consistent with the small incidence of regional and distant metastases and the low mortality rate.

Embryonal carcinomas, often confused with seminomas, differed not only in fundamental cell type but in biologic behavior and prognosis. The cells were frankly epithelial, often cuboidal or columnar, and frequently formed differentiated glandular or papillary structures. Differentiation was often incomplete, so that portions or all of the tumor consisted of unorganized solid epithelial sheets. The obviously anaplastic cells were larger than those of seminomas. The nuclei, which were large, variable, and bizarre, showed few traces of the orderly seminomatous pattern; the chromatin was clumped irregularly into large masses which stood out sharply against the clear background. Cellular types showed more variation from tumor to tumor than did seminomas. Significantly, trophoblastic tendencies were seen in embryonal carcinomas.

Chorioepitheliomas have customarily been placed in a special category. However, histological studies in this series indicated that the trophoblastic tendencies observed in embryonal carcinomas found full expression in the typical chorioepithelioma pattern, that of a combination of compactly grouped cytotrophoblastic cells and giant multinucleated syncytial structures. This, it was believed, justified inclusion of chorioepitheliomas in the embryonal carcinoma group.

The somatic potentialities of testicular tumors were shown in the teratomas, which were characterized by the presence of epithelial masses, glands, and cysts, many of which were organized in combination with undifferentiated or specialized mesenchymal tissues, such as cartilage, into structural units. A teratoma is termed "adult" if it has no histologically recognizable malignant components; however, metastasis of testicular tumors which appeared to be only adult teratomas is reported to have occurred.

The classification of "teratocarcinoma" was proposed for the large group of pleomorphic tumors in which both differentiated teratoid structures and histologically malignant elements were present. Rather than the conventional belief that the presence of embryonal carcinoma in teratocarcinomas is accounted for by malignant transformation of an "adult" structural component, the authors hold that the "adult" structures have differentiated *in situ*, probably from the carcinomatous cells. This is supported by the intimate association of glands and other differentiated epithelial structures with both carcinomatous epithelium and organized mesenchymal components within the tumor.

A study of mortality rates and incidence of metastases indicated that, for seminomas, the immediate prognosis is good. In contrast, the immediate prognosis is bad for embryonal carcinomas and chorioepitheliomas, and poor for teratomas and teratocarcinomas.

Ninety per cent of embryonal carcinomas metastasized as embryonal carcinomas or chorioepitheliomas. Roughly, half of the teratoid neoplasms which metastasized gave rise to growths with teratocarcinomatous structures and half to pure embryonal carcinoma.

The authors state that the architecture of testicular tissue is not reproduced in seminomas and, therefore, the term "seminoma" is inappropriate. They conclude that "seminomas" are probably tumors of primordial germ cells and should be called germinomas. Embryonal carcinomas and teratoid tumors, which are composed of evolving and differentiating somatic and trophoblastic tissues, are neoplastic expressions of the unlimited potencies of embryonic cells. CLARENCE V. HODGES, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Schlumberger, H. G.: Fibrous Dysplasia of Single Bones (Monostotic Fibrous Dysplasia). *Mil. Surgeon*, 1946, 99: 504.

During the war the Army Institute of Pathology received tissue and records of 69 cases of fibrous dysplasia occurring in Army personnel. This paper reports the study of 67 of these, which were monostotic. The ribs were most frequently involved, and the small bones of the hands and feet were never involved.

The roentgenogram in this disease is not specific, and diagnosis is made by biopsy. The correct diagnosis was not made in any case by the roentgenologist. Eighteen resected ribs were studied.

The lesion appeared as symmetrically fusiform or almost spherical swellings ranging up to 6 cm. in diameter. The surface consisted of thin but intact cortical bone. On section the cancellous bone and marrow were found to be replaced by a firm, resilient yellow-white tissue containing occasional small cysts which were usually filled with amber fluid. This tissue had a gritty character because of the presence of innumerable minute spicules of bone. Histologically, the material resembled normal callus. Within the fibrous tissue, and most abundant at its periphery, were trabeculae of partly calcified newly formed bone, formed by direct metaplasia of the connective tissue.

The author believes that monostotic fibrous dysplasia can be distinguished histologically from neurofibromatosis by failure to find any nerve fibers in the lesion, but that ossifying fibromas and nonosteogenic fibromas are histologically indistinguishable from this disease, and should be considered as variants of fibrous dysplasia. Albright's syndrome, characterized by osteitis fibrosa disseminata, areas of pigmentation, and endocrine dysfunction, is a polyostotic fibrous dysplasia and probably has nothing in common with monostotic fibrous dysplasia. It is not a congenital anomaly.

Evidence is presented to suggest that the disease may represent a disturbance of the normal reparative processes following injury to bone.

VERNON C. TURNER, M.D.

Newman, F. W.: Paget's Disease. A Statistical Study of 82 Cases. *J. Bone Surg.*, 1946, 28: 798.

This study covers a 15 year period at the Hospital of the University of Pennsylvania, representing an incidence of Paget's disease of over 0.06 per cent of the total of about 127,000 case histories.

The disease was fairly equally distributed between males and females, over 40 years of age in 79 cases, among which 70 patients were over 50 years of age. Only 3 cases occurred in individuals under 40 years of age. In only 48 per cent of the cases were the chief complaints closely related to Paget's disease. In the remainder the Paget's disease was an incidental finding.

The bones involved were chiefly the pelvis, skull, spine, and femur, but there were some cases in which the tibia, humerus, radius, fibula, and metacarpals were involved.

The calcium (blood serum) varied from 9.4 to 12.2 mgm. per 100 c.c. The serum-phosphorus levels ranged from 2.6 to 6.75 mgm. per 100 c.c. The alkaline-phosphatase level showed a definite elevation in most cases and is considered by the authors as the most useful of all laboratory procedures. The serum-phosphatase levels varied from a low normal of 0.8 Bodansky units to a high of 175 units. The acid-phosphatase levels varied from a normal low of 0.1 to 2.0 units. The alkaline-phosphatase levels varied from a low normal of 2.6 to 48.8 units.

The roentgenograms were diagnostic, the differential diagnosis from metastatic carcinoma from the prostate being very important. The complications in the order of their frequency were cranial nerve pressure, fractures, urinary calculi, and sarcomatous degeneration. In this series there were only 2 proved cases of sarcoma.

Relief of the presenting symptoms was directed by the respective specialties. Roentgenotherapy was formerly given in an attempt to relieve pain. Magnesium carbonate powder, 1 teaspoonful 2 or 3 times daily, and a low calcium diet were recommended.

DANIEL H. LEVINTHAL, M.D.

Herdner and Malgras: Costotransverse Tuberculous Osteoarthritis (Ostéo-arthrites tuberculeuses costo-transversaires). *Rev. orthop.*, Par., 1946, 32: 231.

The authors believe that they have identified a localization of tuberculous osteoarthritis that has never before been described. A few cases of tuberculous osteitis of the transverse processes have been described but this was an osteoarthritis that involved the rib, the transverse process, and the joint which connects them. Two cases are described in women 48 and 37 years of age who for months had suffered agonizing pain. Tuberculosis of this very small joint is more serious than that of larger joints like the knee because relief cannot be procured by immobilization. The slightest movement, even that of respiration or coughing, causes the most intense pain. In both of these cases when the lesion had been localized, operation was performed and the patients were completely relieved.

The point that is most emphasized in the article is the necessity for tomographic examination in these cases. A simple roentgen examination is only the first step in the diagnosis. It must be completed by an extremely careful tomographic examination of the

region in which the lesion is suspected; this reveals the lesion by doing away with the shadows of neighboring organs.

The tomograms of these cases are reproduced and a detailed discussion is given of the manner in which the lesions were revealed. Diagrammatic sketches of the involved regions are shown.

AUDREY G. MORGAN, M.D.

Hamilton, J. B., Barner, J. L., Kennedy, P. C., and McCort, J. J.: The Osseous Manifestations of Eosinophilic Granuloma. Report of 9 Cases. *Radiology*, 1946, 47: 445.

Case studies of 9 patients with eosinophile granuloma of bone are presented. All of the patients were seen in an Army General Hospital and were young males. The laboratory findings were normal except as follows: in 2 cases the alkaline phosphatase was increased to 7 and 7.9 Bodansky units, respectively; the sedimentation rate was increased significantly in 1 case; a sternal marrow puncture was made in 1 case and the smear was normal.

Roentgenologically all lesions tended to be osteolytic. In the skull the lesion had little respect for suture lines and usually involved both tables.

The differential diagnosis included the following: fibrosing osteitis developing after a closed injury to the skull, meningiomas (however, these usually show more erosion of the inner than of the other table), epidermoid cysts (which originate in the diploe and expand through both the inner and outer tables), solitary bone cysts, multiple myeloma, osteitis fibrosa cystica, and low grade osteomyelitis.

There is a long discussion of the relationship of this disease to Hand-Schueller-Christian's disease, or lipogranulomatosis, and to Letterer-Siwe's disease, also called reticulosis or nonlipoid histiocytosis.

In this series, with a relatively short period of follow-up, there was no roentgen evidence that roentgen therapy altered the course of the disease, although it did appear to relieve pain.

VERNON C. TURNER, M.D.

Peša, K.: Changes in the Bones of the Wrist in Workers with Pneumatic Tools (Směny na kostech zápěstí při práci s pneumatickým nářadím). *Lékarské listy*, 1946, 1: 249.

The tools included in the workman's compensation law are the pneumatic drill, pneumatic riveter, and the pneumatic hammer. They do not include the tools fixed to an immobile base. The intensity of the percussive effect depends upon the weight of the tool (from 7 to 35 kgm.), the rapidity of the strokes (from 250 to 4,000 percussions per minute), and the length of the stroke (from 12 to 350 mm.). The more tightly the instrument is gripped the less is the impact.

The bones most commonly affected are those of the wrist, although the literature also reports effects in the acromioclavicular, shoulder, and elbow joints, and even spondylitic changes in the spine. The last effects are ascribed to using tools while in the horizontal decubitus, which, even if it does not induce the vertebral changes, could certainly aggravate a spondylosis already present. In addition, there are also described vague effects on the joints, muscles, blood vessels, and nerves. The law recognizes that the progressive effects should require constant exposure to the percussive effects for a sufficient length of time (at least 2 years).

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JOHN W. BRENNAN, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Marino, H.: Volkmann's Contracture of the Upper Extremity. Technique of the Explorative Operation (Contractura isquémica de Volkmann de miembro superior. Técnicá de la operación exploradora). *Bol. Acad. argent. cir.*, 1944, 28: 1021.

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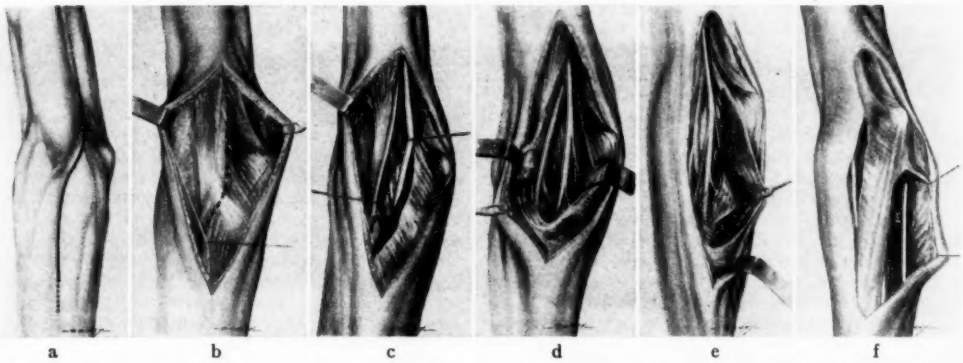
Because of the ischemic paralysis of the upper limb resulting from fractures or vascular lesions, the operative procedure must ensure a perfect approach to



a b c d e f

Fig. 1. a, Incision line. b, Aponeurotic layer. c, The incision of the aponeurosis shows the nerves, vessels, and the pronator teres. d, The artery and its branches, and the median nerve covered by loose connective tissue and easy to reach. This is the site where compression lesions begin. e, The dissection of the pronator teres is followed downward, showing the flexor digitorum sublimis and the artery and nerve lying underneath. f, The investigation of the ulnar nerve.

the lower part of the arm and anterior part of the elbow and forearm, with good vision of the median and ulnar nerves, the brachial artery and its branches, and the radial and ulnar arteries. Incisions have to be wide and easily extendible. Fiolle and Delmas devised a technique which was applied to elbow injuries in World War I; this allowed the exploration of the three main arteries of the upper limb, although it did not permit the study of the ulnar nerve and the lower portion of the forearm.

The author proposes the following technique: the incision starts at the inner edge of the biceps, at the juncture of the middle and lower third of the arm, following that edge downward, crossing in front of the elbow, bending toward the axis of the limb, and following that line as far as necessary.

In early cases the surgeon will find branches of the medial brachiocutaneous nerve in the subcutaneous tissue and the musculocutaneous nerve below them. Sometimes the superficial vessels have to be cut, but in older cases they will not exist or will be very small. Dissection must be performed even if it is difficult because of infiltration of the tissues.

The first element to be studied is the median nerve, which can be seen at the internal edge of the biceps muscle and under the brachial aponeurosis. It is freed with the scalpel and section of the aponeurosis is continued downward following the incision line (b). This incision of the forearm is performed between the pronator teres and supinator longus, in the form of a channel in which the nerve lies (c).

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The investigation of the brachial artery is easy: it is found in the arm, just lateral to the median nerve and surrounded by veins. If the artery is of good size, it should be followed upward to a normal area where a periarterial sympathectomy is performed. If the caliber of the artery is very small or the artery does not exist, an arteriectomy is advised, with two ligatures including the injured portion.

The nerve is often only partially injured and a good dissection will permit wrapping it with muscular tissue. If the continuity is lacking it must be reestablished by a graft at a second operation.

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Once the section of aponeurosis and scars is complete and the treatment of nerves and arteries accomplished, the wound is sutured, that is, only the subcutaneous tissue and the skin. The aponeurosis and injured muscular fibers are left loose to avoid recurrence. Immobilization with a plaster splint is advised during the healing period. Afterward, mobilization, physical therapy, and thermotherapy will complete the treatment, aiding the return, at least partially, of the movements of the limb.

H. Marino, M.D.

region in which the lesion is suspected; this reveals the lesion by doing away with the shadows of neighboring organs.

The tomograms of these cases are reproduced and a detailed discussion is given of the manner in which the lesions were revealed. Diagrammatic sketches of the involved regions are shown.

AUDREY G. MORGAN, M.D.

Hamilton, J. B., Barner, J. L., Kennedy, P. C., and McCort, J. J.: The Osseous Manifestations of Eosinophilic Granuloma. Report of 9 Cases. *Radiology*, 1946, 47: 445.

Case studies of 9 patients with eosinophile granuloma of bone are presented. All of the patients were seen in an Army General Hospital and were young males. The laboratory findings were normal except as follows: in 2 cases the alkaline phosphatase was increased to 7 and 7.9 Bodansky units, respectively; the sedimentation rate was increased significantly in 1 case; a sternal marrow puncture was made in 1 case and the smear was normal.

Roentgenologically all lesions tended to be osteolytic. In the skull the lesion had little respect for suture lines and usually involved both tables.

The differential diagnosis included the following: fibrosing osteitis developing after a closed injury to the skull, meningiomas (however, these usually show more erosion of the inner than of the other table), epidermoid cysts (which originate in the diploe and expand through both the inner and outer tables), solitary bone cysts, multiple myeloma, osteitis fibrosa cystica, and low grade osteomyelitis.

There is a long discussion of the relationship of this disease to Hand-Schueller-Christian's disease, or lipogranulomatosis, and to Letterer-Siwe's disease, also called reticulosis or nonlipoid histiocytosis.

In this series, with a relatively short period of follow-up, there was no roentgen evidence that roentgen therapy altered the course of the disease, although it did appear to relieve pain.

VERNON C. TURNER, M.D.

Peša, K.: Changes in the Bones of the Wrist in Workers with Pneumatic Tools (Směny na kostech zápěstí při práci s pneumatickým nářadím). *Lékarské listy*, 1946, 1: 249.

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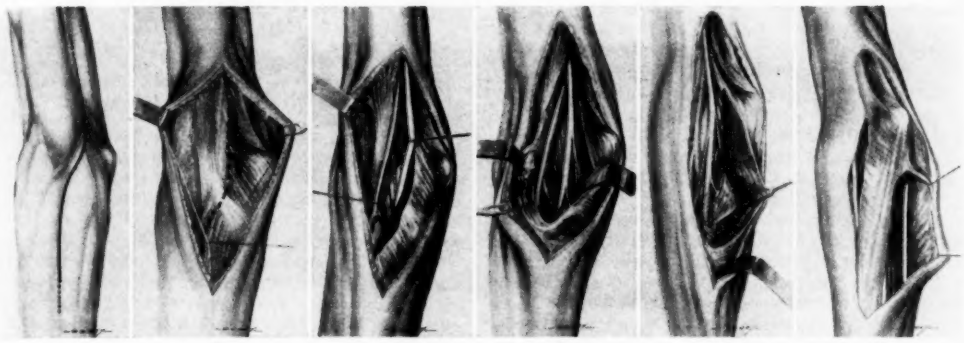

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H. Marino, M.D.

Guilleminet, M., Roy, J. C., and Andrie, G.: Results of Arthroplasty of the Finger Joints (Résultats de l'arthroplastie des articulations digitales). *Rev. orthop.*, Par., 1946, 32: 277.

Little is known of the late effects of arthroplasty of the finger joints. The authors therefore describe and illustrate with photographs 5 cases in which they have operated, the most recent one 6 months ago and the oldest 9 years ago. The results were very good in 3 cases and poor in 2 cases.

The authors overcome the ankylosis by removing the sclerotic periarticular tissue, restoring the joint surfaces as nearly as possible to their original form, and placing between the two surfaces some substance which will prevent osteogenesis and renewed ankylosis. They have used fascia lata in all their cases. The operation is performed best under general anesthesia, and the incision may be lateral or dorsal. This operation is indicated in post-traumatic ankyloses, but not in ankyloses following infectious arthritis, and probably not in those due to chronic rheumatism, although the authors have had no experience in this form.

A good part of the effect of the operation depends on the patience and skill of the patient in re-educating his fingers. This is a long and painful process and some patients will not keep up the necessary tedious daily exercises after they are dismissed from the physician's care. The best result was obtained in the case of a physician who needed his finger for gynecological and obstetrical examinations and who exercised great patience and skill in the re-educating exercises. On the other hand, one of the patients who could not be kept under observation was evidently careless in this respect and the result obtained in this case was not very satisfactory.

AUDREY G. MORGAN, M.D.

Schwartz, R. P.: Arthrodesis of the Subtalus and Midtarsal Joints of the Foot. *Surgery* 1946, 20: 619.

Impairment in the function of locomotion may be due to deformity with or without instability of the foot resulting from trauma, infection, disordered nerve impulses, or congenital influences. A fairly comprehensive historical review is presented, describing the various methods of stabilization.

The author describes his preoperative analysis to reveal the individual variations and carefully plan the correction of the particular structural abnormalities. Mediolateral and plantar dorsal roentgenographic tracings are made preoperatively and the lateral view is cut into three parts, the upper representing an outline of the astragalus and lower tibia, the inferior-posterior representing the calcaneus, and the inferior-anterior representing the foot anterior to the mediotarsal joint. These sectional tracings are superimposed upon each other, the composite representing the optimum restoration desired and the amount of cartilage and bone which must be removed. This restoration is checked with the lateral view postoperatively.

DANIEL H. LEVINTHAL, M.D.

Tavernier, L.: Pseudarthroses with Bone Loss Treated with Flexible Bone Grafts and Intramedullary Wire (Pseudarthroses avec perte de substance osseuse traitées par greffes souples sur broche métallique intra-médullaire). *Lyon chir.*, 1946, 41: 545.

The treatment of pseudarthroses with bone defect always has been a difficult problem. A rigid bone graft can be readily employed in cases in which large bones are involved. Even then the condition often is complicated by secondary fracture of the bone graft. In pseudarthroses of slender bones, such as the bones of the forearm, fixation of rigid grafts is extremely difficult and disalignment of the fragments very often occurs. The use of flexible grafts (osteoperiosteal or cancellous bone) facilitates the procedure considerably but it is difficult, if not impossible, to keep the fragments in proper alignment. Immobilization in a plaster cast is often sufficient, but it is inadequate in many cases, for example, in pseudarthroses of both bones of the forearm.

The method of using flexible grafts and intramedullary wires has the advantages of both methods without their faults. Maintenance of the position of the fragments is as secure as with the use of rigid grafts, the procedure is simple, and the osteoperiosteal graft has the same osteogenic qualities as the cancellous bone grafts.

The advantages of this method are clearly demonstrated in pseudarthroses of both bones of the forearm. The 4 fragments are brought into proper alignment with Kirschner wires. The fixation is sufficiently mobile to allow the application of flexible bone grafts without losing reduction. A plaster cast is used for additional immobilization of the forearm in midposition. The ultimate result of this type of treatment was much better than that ever obtained by rigid fixation.

This procedure was used in 8 cases, 2 of which were pseudarthroses of both bones of the forearm. Preliminary to the bone grafting scars are excised and the adjacent joints, muscles, and tendons are limbered up with the help of physical therapy. The incision is carried along muscle layers or already existing depressions caused by scar tissue adherence to bone. The bone is freed proximally and distally to the fracture line for a distance of about 3 or 4 cm. There is a tendency to save on exposure to preserve the blood supply to the area, but this makes the operation much more difficult and eventually one is compelled to extend the incision to establish good contact of the host bone with the bone graft. Scar tissue is excised until normal muscle is encountered. This is done to assure proper blood supply. The medullary cavity of both fragments is opened: these cavities are usually closed by a plug of condensed bone. Then the Kirschner wire is inserted into the medullary cavity of both fragments. In case of pseudarthrosis of the ulna the wire is inserted through the olecranon, and in case of the humerus, through the head in the region of the shoulder. In case none of the portions of the bone is easily accessible like in

the radius, an opening is made in one end of the bone extending obliquely into the medullary cavity. The Kirschner wire is made to follow the opening and is guided into the medullary cavity across the pseudarthrosis site into the other fragment. The wire is then cut even with the bone surface. In wiring the radius the opening is made on the dorsal aspect of the distal end of the bone. The osteoperiosteal grafts are removed from the anteromedial aspect of the tibia long enough to cover the defect in the host bone and to extend 3 to 4 cm. on each fragment. These grafts are placed with their rough sides toward the host bone and are fixed by encircling catgut sutures. The muscular and fascial layers are closed snugly to hold the grafts in place.

Although cancellous bone replaces bone defects faster and units more readily with the host bone, the author prefers the osteoperiosteal grafts because of the added stability. The skin is closed. A cast is applied. Roentgenograms are taken after a month.

Three cases are presented: a pseudarthrosis of the radius, of the humerus, and congenital pseudarthrosis of the tibia.

A soldier 25 years of age sustained a double fracture of the radius due to a shell explosion in February, 1944. In February, 1945 he was operated upon in a military hospital because of a persistent pseudarthrosis. In November, 1945 malunion of the proximal fracture site was apparent. The pseudarthrosis of the distal fracture persisted. The bone graft used for the repair of the distal fracture at the first operation was found to be dead and had to be excised in the second attempt at repair. At the second operation the malunion of the proximal fracture was osteomized and the fibrous tissue forming the pseudarthrosis of the distal fracture was excised. The marrow cavity was opened in all three fragments. Through a prepared opening in the distal portion of the radius a Kirschner wire was inserted and guided proximally into the medullary canal through all three fragments. The alignment at the proximal fracture site was satisfactory but there remained a defect from 2 to 3 cm. in length at the distal fracture site. A long osteoperiosteal graft taken from the tibia was placed over the radius to extend from 3 to 4 cm. distally and proximally beyond the fracture line. The graft was fixed with catgut to the upper and lower fragments.

At the end of a month there was still some motion at the distal fracture site and a new cast was applied. At the end of 2 months the "consolidation" was complete but there was considerable dorsal deviation of the distal end of the radius. An osteotomy corrected the deformity of the radius. At the end of another month "consolidation" of the fracture sites was complete. The shape of the forearm, supination, and pronation were nearly normal.

Without the "medullary splinting" with Kirschner wire, repair of the malunion would have failed and the result most likely would have been a "Z" shaped deformity of the radius which would have blocked pronation and supination.

The author reports the case of a 19 year old female who had had acute arthritis of the left hip and right shoulder when a child. Several years before the left hip had been reconstructed by an arthroplasty. Osteomyelitis of the right humerus caused growth arrest in that bone. The humerus measured only 17 cm. in the roentgenogram. The patient requested that the arm be made longer, because she wanted to get married. On December 12, 1945 a "Z" osteotomy was done on the midportion of the humerus. A Kirschner wire was inserted transversely into each end of the bone and traction of 5 kgm. was applied to each end. It is generally difficult to get more than 4 cm. lengthening in a normal extremity. After a few days of traction a gain of 10 cm. in length was observed. The traction was removed and a weight was attached to the wire through the distal end of the humerus, the patient being allowed to be ambulatory and carry the arm in a sling. Bony union at the osteotomy site did not take place. On February 18, 1946 a bone grafting operation was done. Two osteoperiosteal grafts were used: the longer graft was placed on the anterior aspect of the humerus and the shorter one was placed on the posterior aspect of the bone. The grafts were held in place with catgut sutures. Prior to this procedure a Kirschner wire was inserted into the medullary canal to bridge the bone defect.

On the tenth postoperative day a superficial abscess had to be incised. In spite of a persistent fistula, bony union was observed on the seventieth postoperative day. The arm was from 6 to 7 cm. longer.

In another case, a child was admitted to the hospital in January, 1943 because of a deformed leg. There was considerable bowing of the lower leg in its distal third. This deformity followed a fall 2 months prior to admission. On March 5, 1943 a sliding bone graft was applied by following Albee's technique to correct the deformity. Because of an "osteolytic process" the graft as well as portions of the proximal and distal fragments became resorbed. In spite of walking casts and caliper braces the outward bowing of the leg increased more and more and finally the fibula broke. It was generally agreed that this was not a simple fracture of the tibia caused by a fall but a congenital pseudarthrosis of the tibia. Further questioning of the parents confirmed the diagnosis. On February 15, 1945 an open reduction with bone grafting was done. The scar tissue between the fragments was excised. By means of a "manual osteotomy" of the fibula satisfactory alignment of the bones of the leg was made possible. A Kirschner wire was inserted into the medulla of both fragments of the tibia and cut even with the cortical surface of the bone. An osteoperiosteal graft was taken from the other tibia and fixed to the host bone with encircling catgut sutures. Smaller bone grafts were used to fill the defect between the bone fragments.

The plaster was changed one month after operation. One hundred days after the operation the pa-

tient was allowed to be about in a "Delbet plaster." Re-examination after another month, however, revealed motion at the fracture site, and some decalcification of the distal end of the graft was noticed. On July 23, 1945 another operation was done. Fibrous and fibrocartilaginous tissue was found to bridge the defect. After excision of the fibrous tissue an osteoperiosteal graft taken from the other tibia was used to bridge the bone defect. At the end of a month union was almost complete and walking in a "Delbet plaster" was allowed. A roentgenogram taken in March, 1946 revealed that the Kirschner wire broke at the level of the old site of the pseudarthrosis. The wire was extracted. Today the patient walks without any difficulty although the leg is about 3 cm. shorter.

In conclusion, it is pointed out that the outlined procedure is very effective in cases in which union usually is very difficult to obtain. Infection usually destroys the graft and interferes with the formation of solid callus, yet it failed to prevent the formation of callus and to destroy the graft in the cases treated by the author. Another interesting observation was the fact that the Kirschner wire broke even after union was established. The author was forced to extract a Kirschner wire which was left in a tibia with pseudarthrosis for several months. This wire was made of steel covered with chrome (not of nonoxydizable steel). He observed that the wire was superficially oxidized along its entire length. The portion of the wire which came to lie at the level of the pseudarthrosis was eroded and three quarters of its thickness was destroyed. Evidently the wire did not break because of some mechanical factor since the fracture appeared to be healed at the time when the wire was already broken. It broke because of the "biological processes of oxidation" that take place at the site of a healing pseudarthrosis. This also explains the fact that the intramedullary grafts used in the repair of recent fractures and pseudarthroses frequently break transversely at the fracture site. It is apparently due to the action of "very active oxydases" which are found in areas where bone is rebuilt.

Similar favorable results were obtained in the 5 other cases treated in a similar manner, and the author feels justified in stating that this type of treatment is easy and efficient.

GEORGE I. REISS, M.D.

Adams, A. O.: Neurectomy to Produce Atrophy of the Amputation Stump. *J. Bone Surg.*, 1946, 28: 716.

The author believes that neurectomy offers the advantage of causing a more rapid and complete atrophy of the amputation stump in large muscled adults rather than other operative procedures. The object is to produce a conically shaped stump. This was achieved in 5 cases, in 3 of which the nerve operation was done at the time of primary amputation. In the 2 other cases, subsequent nerve operations were performed.

A longitudinal incision 2½ inches in length is made in the lower part of the popliteal space, extending down the leg. The medial sural cutaneous nerve should not be damaged. This nerve may be used as a guide to follow down into the popliteal space to the tibial nerve. The muscular branches of the tibial nerve to the two heads of the gastrocnemius are identified and completely sectioned. The branch to the soleus leaves the tibial nerve at a lower level, but is within the operative field and may be sectioned. The location of this incision is such that the scar has not been objectionable. C. FRED GOERINGER, M.D.

FRACTURES AND DISLOCATIONS

Urist, M. R.: Complete Dislocations of the Acromioclavicular Joint. The Nature of the Traumatic Lesion and Effective Methods of Treatment with an Analysis of 41 Cases. *J. Bone Surg.*, 1946, 28: 813.

An analysis is presented of 41 cases in which there was a complete dislocation of the acromioclavicular joint. All of the patients were strong, active, young soldiers who variously acquired their injuries through acts of violence. Twenty-three of these injuries were acute and were recognized early: the remaining 18 cases were chronic. Eleven cases reported in both groups presented associated fractures of the clavicle, the acromion process, and the coracoid process.

A table is included showing a classification of anatomical variations in the acromioclavicular joint in 100 random roentgenograms of the shoulder. The mechanism of injury and the traumatic lesion are discussed. Experimental observations are reported. An examination of resected joints is reported. The following were of value during treatment: (a) widening of the joint spaces; (b) ballottement; and (c) evolution of the symptoms. Another table contains significant data regarding 18 complete dislocations of the acromioclavicular joint treated by early reduction and immobilization for 6 weeks. In 12 cases the results were excellent and in 6 there were residual symptoms. A similar table shows significant data regarding 11 complete dislocations of the acromioclavicular joint seen late and not treated. All of the patients had marked residual symptoms. Another table presents significant data regarding 5 complete dislocations of the acromioclavicular joint treated primarily by various methods. In 3 there were excellent cosmetic results with pain, while in 2 there was slight deformity and subluxation with no residual symptoms. The purpose of treatment in these cases is to secure anatomical reposition and to relieve the symptoms. On the other hand, a patient with a poor anatomical result may have no symptoms. Conservative methods of reduction of the dislocation include bandages, adhesive dressing and strapping, suspensions, harnesses and braces, and plaster of Paris splints.

Fifteen shoulders with complete dislocation of the acromioclavicular joint were treated by means of a plaster jacket applied around the body to the level

of the axillae. A pad was placed across the dislocated acromioclavicular joint, and an elastic shoulder strap was stretched tightly over the clavicle. Then the ends were doubled back on themselves between layers of plaster bandage incorporated in the body cast to maintain constant pressure. The scapula was elevated by means of raising the shoulder girdle and incorporating the upper extremity in the body cast in this elevated position. Immobilization was continued for 6 weeks. Twelve of the 15 soldiers returning to duty were completely cured after a period of physical therapy and rehabilitation. In 1 case subluxation developed without pain or limitation of motion. The 2 remaining cases presented subluxation associated with symptoms; eventually the patients were subjected to surgical treatment.

The surgical methods used were open reduction and internal fixation, arthrodesis, coracoclavicular screw fixation, skeletal traction, and excision of the outer end of the clavicle. Primary excision of the joint is probably not justified in dislocations associated with fractures until a period of duty establishes disability. Complications and sequelae are discussed. The chief obstacle to effective conservative treatment has been found to be interposition of parts between the joint surfaces. Excision of the outer end of the clavicle was used successfully in 9 cases in this series. RICHARD J. BENNETT, JR., M.D.

Kestler, O. C.: Recurrent Dislocation of the First Carpometacarpal Joint Repaired by Functional Tenodesis. *J. Bone Surg.*, 1946, 28: 858.

A review of the literature disclosed that 3 procedures have been suggested for the radical cure of recurrent dislocation of the first carpometacarpal joint.

A case report is presented. The operation devised takes into account that the tendons have a logical anatomical course and that the function of the muscle should actively hold the involved bone in place. Also, the procedure should not interfere with the original function of the tendon. The author states that these requirements were fulfilled in the case reported. The operative procedure, which uses the abductor pollicis longus tendon, is explained in detail. RICHARD J. BENNETT, JR., M.D.

Cobey, M. C., and White, R. K.: An Operation for Nonunion of Fractures of the Carpal Navicular. *J. Bone Surg.*, 1946, 28: 757.

Operative procedures are not considered in fractures of the carpal navicular until a full trial of immobilization has been given. Twelve weeks is considered a reasonable period for union. No fracture older than a year was grafted in this series. The criteria of nonunion are based on roentgenographic findings alone. The operative procedure is explained in detail. The bone graft can be removed from the distal quarter of the radius. Three drill holes are carried across the line of fracture from one fragment into the other. Three square peg grafts 1/8 inch in diameter are made and driven into the individual holes made by the drill. A cast similar to that used for fracture is applied. A roentgenogram is taken at the end of 6 weeks. After union is complete, active motion in graduated exercises is started.

Ninety cases have been treated. Of these, 51 were fresh fractures. The average time required for union in these fresh cases was 7.4 weeks. There were 2 cases of nonunion. Bony union subsequently resulted in these 2 cases after bone grafting. Thirty-nine old cases of nonunion which had been treated previously were seen: these ranged from 5 months to 18 years in duration. Ten of these were suitable for the bone graft operation. Of the 10 cases among the untreated fractures in which there was nonunion, 7 resulted in union. The average period of immobilization after operation was 9.6 weeks. The history of 6 cases is reported in detail.

RICHARD J. BENNETT, JR., M.D.

ORTHOPEDICS IN GENERAL

Hollinshead, E. H., and Markee, J. E.: The Multiple Innervation of Limb Muscles in Man. *J. Bone Surg.*, 1946, 28: 721.

By a careful and rather complete dissection of one cadaver supplemented by the use of routine dissecting laboratory material, the authors show that of 58 long muscles of the limbs with separate heads of origin, all but 15 were entered by nerve branches at more than one point. Ten of these 15 were known to receive more than one branch in other individuals. These multiple branches may enter the muscle close together or may be distributed for some distance over the length of the muscle. In neither pattern of branching can the ultimate distribution of the nerve fibers within the muscle be deduced from a purely morphological study. Other authors have shown that the multiple nerve branches entering a muscle may control contraction of different segments along the muscle. DANIEL H. LEVINTHAL, M.D.

Sweetapple, H. A.: Sudeck's Atrophy. *Med. J. Australia*, 1946, 2: 581.

A typical case of Sudeck's atrophy is one which sustains a relatively minor injury to a limb, accompanied by an intractable pitting edema, stiffness of the musculotendinous apparatus, and roentgenological evidence of bone decalcification. Moreover, immobilization in plaster Paris, rest, and other forms of empirical treatment retard progress rather than ameliorate the syndrome.

The disorder is based upon a vasomotor dysfunction. The skin is dusky red, and it may be hot or extemely cold. Pain, swelling, and osteoporosis are thought to be secondary to vasomotor changes in the deeper structures of the limb. When these manifestations prevail for a long period, the basic disorder spills over into the autonomic nervous system, and the morbid alteration of the affected parts are no longer reversible.

It is the author's contention that Sudeck's atrophy is a misnomer. Early in its incipiency the syndrome reveals a mottled appearance of the bone; later a

uniform osteoporosis ensues. Diagnosis of the disease should be made prior to the appearance of generalized osteoporosis, rebellious edema, and the intractable pain. Macroscopically, the effects of Sudeck's atrophy on the bone architecture may show loss of cortical definition, fading of the lamellae, considerable thinning of the cortex, rendering it roentgenologically indistinguishable from tuberculous osteitis.

Etiology. Hyperemia and sympathetic reflex irritability are mentioned. Equivocally enough, sympathectomy cures the syndrome on the ground of complete peripheral vasodilatation. That calcification is due to hyperemia, and vice versa, is maintained by Leriche and others. However, after a perusal of the various hypotheses connoted in the article, one cannot conclude that the mechanism of Sudeck's atrophy is fully understood.

Treatment. 1. Sudeck's atrophy is said not to exist if the patient responds to rest, immobilization, and manipulation. In such cases the diagnosis is erroneous. 2. If a vicious circle exists because of thrombosed vein, adhesions of local nerve, and adjacent structures, correction of each of these abnormalities proves effective. Blocking of a trigger point with novocain, stripping of the adventitia of the main artery of the limb, as advocated by Leriche and his co-workers, or ramisection and alcohol or novocain sympathetic block is beneficial in a substantial number of intractable cases.

The author discusses three typical cases in which periarterial stripping was followed by a dramatic relief of pain, cyanosis, and osteoporosis.

SAMUEL L. GOVERNALE, M.D.

Glissan, D. J.: Hallux Valgus and Hallux Rigidus. *Med. J. Australia*, 1946, 2: 585.

Hallux valgus, this most common deformity of the foot, per se, is accompanied by other foot disorders. Flat foot and contracture of the toes are concomitant deformities. Similarly, the symptoms manifested are not necessarily those of hallux valgus. On the contrary, the symptoms are due to a general defection in the function and structure of the foot in which all of the toes sooner or later are involved. The deformity may be unilateral or bilateral. In the majority of instances, the deformity is not a primary one, but it may be a congenital anomaly of the first metatarsophalangeal joint. Moreover, the writer emphasizes that painful feet in children whose parents already have hallux valgus may be harboring the deformity as early as the tenth or twelfth years of age.

The lengthy technique can be justifiably summarized as follows:

An elliptical skin incision is made. The extensor tendons are reflected and possibly lengthened. The periosteum of the first metatarsal bone is stripped and a wedged osteotomy is performed just proximal to the reflection of the attached metatarsophalangeal capsule. The two bones are completely osteotomized, and the medial cortical "spike" is abutted laterally to the distal base or head of the metatarsal bone. The periosteum, fascia, and skin are then closed. Immobilization in the overcorrected position is accomplished with an aluminum splint insulated with plaster of Paris.

The etiology of hallux rigidus includes trauma, infection, osteochondritis juvenilis, and Scheuermann's lesion. The symptoms of hallux rigidus may be those of pain, impaired range of motion of the big toe, marginal osteophytes, and, in severe cases, flexion deformity of a crippling nature.

Treatment is not to be instituted in children until they have passed the age of 12. In older patients, in whom fusion is the treatment of choice, the author encountered failures particularly when the articular surfaces were hard, eburnated, or sclerosed. In the majority of cases, however, fusion was both satisfactory and worthy of continued application.

SAMUEL L. GOVERNALE, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Kimbarovskii, M. A.: Experiences with the Operative Treatment of Aneurysm and of Pulsating Hematoma from 1941 to 1946. *Vrachebnoe Delo*, 1946, No. 66, 338.

Of the 237 cases forming the basis of this report, 8 were involvements of the common carotid artery, 3 of the external carotid artery, 1 of the internal carotid artery, 2 of the transversa colli artery, 1 of the transversa scapulae artery, 1 of the vertebral artery, and 1 involving 3 arteries of the neck (vertebral, internal carotid, and a smaller artery). There were 28 cases involving the subclavian artery and 1 case involving the long thoracic artery. There were 51 arterial involvements of the upper extremities and 140 of the lower. Of these, those of the femoral artery showed a preponderance with 76 cases. However, since the arteries of the extremities did not offer anything unusual in diagnosis, surgical treatment or results obtained, they are not given special discussion. The injury to the blood vessel resulted from a bullet in 122 (51.5%) of these patients, from splinters of shell and airplane bombs in 22 (9.2%), and from mines in 93 (29.2%). This shows a paucity of bullet wounds in comparison with previous wars. The formation of the aneurysmal sac may not occur until weeks, of even years, after the injury to the blood vessel, and its appearance may be wholly unexpected; in 1 of the author's cases the diagnosis of phlegmon was made by the consulting staff of the hospital.

There are surgeons who do not believe in immediate operation, in the hope of obtaining spontaneous healing; however, this occurred in the author's material in only a single instance. In general, he believes that the arterial aneurysm, while still small and not endangering the blood supply to the extremity, justifies a waiting attitude in individual instances. On the other hand, the arteriovenous aneurysm demands immediate operation. However, when the aneurysm has not been operated upon before it reaches the evacuation hospital, and there is no immediate indication for interference, operation on the injured blood vessel should not be done sooner than from 4 to 6 weeks. This gives the surrounding tissues time for resolution of the bloody infiltration and for the development of the collateral circulation.

With reference to the type of operation, there is also a difference of opinion among surgeons. Some recommend vascular suture, which must, of course, be regarded as the ideal operation, while others prefer vascular ligation. However, in practice the former operation exhibits a number of complications which limit its theoretical indications. The author has carried out vascular suture in only 3 instances. Despite the fact that the author regards the technique of vascular suture as easier to accomplish than is generally supposed, he sees no reason for regarding this procedure as the operation of choice. The character of his material has rather prejudiced him against vascular suture, both because so many of his patients showed infection of the wound with retention of devitalized tissues and foreign bodies, and because so many of the blood vessel injuries resulted from the splinters of shells and bombs with extensive and irregular destruction of the wall of the blood vessel which rendered suture difficult. The method preferred by the author is that of Antilus or, better, of Phylagrius. The most radical, logical, and technically feasible method is that of Phylagrius, consisting of ligation of both the afferent and efferent vessels with complete extirpation of the sac. This extirpation is carried out as far as possible from every direction and with blunt dissection. However, occasionally a sharp instrument may be resorted to or, in cases of too intimate adhesions, strips of the sac may be left *in situ*. When the operation of Phylagrius is anticipated an attempt is made to encourage the development of collateral vessels by putting pressure on the afferent vessels for 15 or 20 minutes twice daily. Extirpation of the regional sympathetic ganglia was done prophylactically in a number of instances. The operation is given enthusiastic support as a preventive of gangrene. In operation on the arteriovenous aneurysm the ligation of the vein together with the artery is believed to offer the best chance of avoiding the development of gangrene in the affected extremity.

Altogether, the vascular suture was carried out in 3 instances, the operation of Antilus in 89, and that of Phylagrius in 145. In the neck injuries the blood vessel was frequently injured so low in this region that partial resection of the clavicle and even of the chest wall was necessary. There were only 2 failures: the patient with the injury involving 3 vessels in the neck succumbed to a whole series of complications, and gangrene developed in a patient with involvement of the leg. However, in the last instance the injury was complicated by a badly frozen foot.

JOHN W. BRENNAN, M.D.

Freeman, N. E.: Arterial Repair in the Treatment of Aneurysms and Arteriovenous Fistulas. *Ann. Surg.*, 1946, 124: 888.

The author notes that the incidence of gangrene due to acute ischemia following operations on aneurysms and arteriovenous fistulas is rare. Not a single instance occurred in 100 cases operated upon at DeWitt General Hospital, Auburn, California. There was but one case in the entire series of patients in the three vascular centers of the U. S. Army. This splendid record is probably due to waiting a sufficient length of time for the development of collateral circulation and the perfection of surgical technique in order to spare the important collaterals. In addition,

prophylactic sympathectomy may have helped practically to abolish gangrene after operations on arterial lesions.

The author discusses various objections to the arterial repair in the treatment of aneurysm and arteriovenous fistulas. Despite these objections to arterial repair an attempt was made to restore the continuity of the artery by repair in 23 cases of aneurysms and arteriovenous fistulas on the Vascular Surgical Section at DeWitt General Hospital, between the months of June and November, 1945. Success of the repair was demonstrable either by arteriography or by the presence of the normal arterial pulsations distal to the lesion in 18 of the 23 cases. The only complications which could be ascribed to the attempted repair were the possible recurrence of an arterial aneurysm in one patient and the recurrence of an arteriovenous fistula in another case after transvenous suture.

Detailed clinical experiences are presented, with comments on 22 cases. Transverse repair of the artery was attempted in 17 cases and proved successful in 15. Of the 2 unsuccessful attempts, thrombosis occurred at the suture line in 1 patient, but this was due in part to faulty technique in not obtaining adequate control of the artery above the fistula. In the second individual, repair was attempted of an arterial aneurysm.

The author observes that it has generally been found desirable to use any sound portion of the arterial wall, even to one-sixth of the circumference, rather than to perform a complete transection with end-to-end anastomosis. Mobilization of the artery may be impossible because of important arterial branches. In no case was a significant collateral artery sacrificed in order to attempt repair of the major vessel.

Complete control of the arterial supply to an arteriovenous fistula is essential for repair. Arteriography has been helpful in the study of patients with arteriovenous fistulas. Before operation it has served in the accurate localization of the lesion and in demonstrating the location of important collateral vessels. Again, it has helped to show the presence of an aneurysmal sac. Following operation, arteriograms have been useful in disclosing the true state of continuity of the artery.

The role of sympathectomy in the repair of arterial lesions is not clear. Thirteen of the patients in this series were treated by prophylactic sympathectomy before operation on the arterial lesion. Of this number, two attempted repairs failed. Sympathectomy was not performed in 10 patients. Arterial thrombosis occurred in only one of these cases. It is possible that sympathectomy might have prevented arterial spasm. It is probable that a swift flow of blood prevents thrombosis at the suture line. Possibly sympathectomy may have promoted an increased volume flow of blood and in this way improved the chances of successful repair.

In conclusion the author notes that arterial repair was attempted in the treatment of 23 aneurysms and arteriovenous fistulas. Success was demonstrable either by arteriography or by the presence of normal peripheral arterial pulsations in 18 of these attempts. In one patient, recurrence of an arterial aneurysm was subsequently reported by the patient. In a second patient, recurrence of an arteriovenous fistula followed transvenous suture. Subsequent excision of the lesion was necessary. Thrombosis at the suture line occurred in 3 patients but the collateral circulation proved sufficient to prevent gangrene. Repair of the defect in the wall of the vein was performed on 18 occasions. Phlebography in 12 of the patients, after recovery, demonstrated the patency of the vein in 6 patients but in 6 other postoperative studies, showed the vein to be occluded. No instance of thrombophlebitis or pulmonary embolism was encountered. Transverse suture of the defect in the arterial wall after excision of the damaged portion has been found more satisfactory than longitudinal suture, end-to-end anastomosis, or transvenous repair. Marked improvement in pulsatile circulation in patients after repair of arterial lesions in comparison to a control group who were treated by quadruple ligation and excision of the arteriovenous fistula, has been demonstrated by oscillometry.

The functional capacity, especially as shown by freedom from intermittent claudication, is increased in patients when the continuity of the major artery to the extremity is preserved.

HERBERT F. THURSTON, M.D.

Carroll, W. W.: Venous Surgery. *Q. Bull. Northwest. Univ. M. School*, 1946, 20: 373.

The patients considered in the present report are (1) those with varicose veins resulting from valvular incompetence, and (2) those with cutaneous ulceration of the lower extremities due to venous stasis resulting from various causes.

The author notes that an appreciation of the fact that varicose veins due to valvular incompetence are primarily related to valvular deficiency in the femoral and iliac trunks, makes our search for pathological perforators more logical. Such perforating veins may be located in the thigh, the lower leg, or in the popliteal space. In the latter instance the vein involved is anatomically designated as the lesser saphenous vein. The records in this article show that the resulting reflux was manifest through the lesser saphenous system in 10 per cent of 300 consecutive extremities requiring surgical correction for varicose veins. The technique for the treatment of varicosities of the saphenous vein is described in detail.

Ulceration of the skin of the lower leg related to long standing venous stasis is known to result in serious disability because of a failure to heal. Excision of the ulcer-bearing area and coverage of the saucerized defect with a free skin graft of intermediate thickness results in the elimination of the open wound and its attendant, long-standing, painful duration. Such patients are restored to a satisfactory capacity for work. The author reports complete "takes" in 21 out of 22 such instances without

late breakdown of the grafts. The procedure followed in the grafting operation is described in detail.

HERBERT F. THURSTON, M.D.

Wertheimer, P., and Gauthier, R.: Statistical Record on the Surgical Treatment of Obliterative Arterial Disease of the Extremities (Documents statistiques sur le traitement chirurgical des artérites oblitérantes des membres). *Presse méd.*, 1946, 54: 497.

A 10 year follow-up is reported on 206 cases of obliterative arterial disease of the extremities. Forty-five cases were discarded from the series, 32 because of incomplete records and 13 because they were treated by medical therapy alone. The ages of the patients varied from 27 to 86 years, with an average of 60. There were 165 males and 41 females. The overall mortality during the period of observation was 25 per cent. The high death rate emphasizes the seriousness of the disease and the precarious condition of the patients. Many of these patients were seen by the authors only late in the course of their illness: 64 had well established gangrene at the time of the initial examination.

Eight patients were subjected to adrenalectomy, of whom 6 also had other procedures, such as sympathectomy or splanchnic nerve section. There was 1 death and 1 amputation, and 6 patients in good condition from 1 to 4 years.

Fourteen arteriectomies were done, 10 along with other procedures (9 lumbar sympathectomies). Three of these patients came to secondary amputation. In 10 cases the results were good, in 1 case, mediocre. Ten periarterial sympathectomies were done without 1 favorable result: 83 sympathetic ganglionectomies were performed with a mortality rate of 7.2 per cent. There were 16 secondary amputations and 42 cases in which the progress of the disease stopped or the condition improved.

In 26 cases the treatment consisted of repeated procaine blocks. In 4 of these the patient died: 3 patients had amputations. Fifteen patients remained in good condition. There was no follow-up on the others.

The authors state that peripheral arterial disease should be treated on a physiopathological rather than an etiological basis. Consequently, they hesitate to perform adrenalectomy alone. Likewise, periarterial sympathectomy is discarded as illogical. Arteriectomy is accepted as a simple procedure for obtaining vasodilation but it should be performed in combination with some other form of treatment.

For lumbar sympathectomy a high approach through an incision following the course of the 12th rib is preferred. This approach allows high preganglionic sympathectomy and gives access to the splanchnic nerves and the adrenal gland.

Measures used to improve drainage from infected ulcers, to relieve pain, and to control diabetes are of great importance. It is pointed out that the series represents many late cases in which the arterial disease was far advanced. Among 45 amputations there were 12 deaths. The majority of the patients in this group were more than 70 years of age.

THEODORE B. MASSELL, M.D.

BLOOD; TRANSFUSION

Piatigorskyi, I. V.: The Effect of Various Doses of Ultraviolet Rays on the Blood of Infants. *Pediatria, Akusherstvo and Gynecologia*, 1946, No. 4, 11.

The author studied the effect of the erythema dose and biological doses of ultraviolet rays on the blood of 20 infants from 1 month to 1 year old. No increase of hemoglobin could be found, irrespective of the dose of ultraviolet rays. On the other hand, marked rise of the reticulocytes in the blood was noticed, especially if an erythema dose was given.

The author concludes that for the purpose of stimulation of the regenerative activity of the bone marrow, an erythema dose of ultraviolet rays should be applied to the reflexogenetic zones. Ultraviolet irradiation alone has no effect on the course of hypochromic anemia, but it may be indicated in selected cases as a supplement to other therapeutic measures.

JOSEPH K. NARAT, M.D.

Flink, E. B., and Skubi, K. B.: Blood Transfusion Studies. The Survival of Fresh and Stored Transfused Erythrocytes as Determined by Urobilinogen Excretion. *J. Lab. Clin. M.*, 1946, 31: 1074.

The survival of the transfused erythrocyte has been studied by three methods: the differential agglutination method of Ashby and Wiener; the use of radioactive iron which is incorporated in the hemoglobin molecule, as done by Ross and Chapin; and the study of urobilinogen excretion following transfusion, as reported by Wasserman, Volterra, and Rosenthal.

It is the consensus that the average in vivo survival time of fresh transfused erythrocytes is more than 30 days and that some survive as long as 120 days. As the storage time of citrated blood increases, the red cell survival time decreases. From the data available, it appears that citrated blood stored 3 days or less is equal to fresh blood in respect to survival. It has been noted that the addition of glucose to the citrated blood of experimental animals enhanced the keeping qualities and the in vivo survival of transfused blood.

In order to study the relative efficiency of the blood in the University of Minnesota Hospital blood bank, the values of the serum bilirubin, plasma hemoglobin, and feces urobilinogen were observed before and after fresh and old blood transfusions. The urobilinogen excretion roughly indicates the rate of cellular destruction after transfusion. The plasma hemoglobin showed no appreciable change and no significant intravascular hemolysis took place following either fresh or old blood transfusions. In all the cases studied, there was a greater rise in the bilirubin concentration after the old blood than after the fresh blood transfusion. The maximum

was found usually at 5 hours after transfusion, and this finding is in agreement with the observations of others. Feces urobilinogen was considerably increased after old blood but not after fresh blood transfusions.

In 5 of 6 patients studied, it was apparent that an increased rate of destruction of blood must have taken place after the use of old blood compared with that following the use of fresh blood. It is thus evident that there is an increased extravascular destruction of red blood cells after transfusion of old blood, for there is a significant rise in the serum bilirubin and feces urobilinogen excretion after such a transfusion.

LEROY J. KLEINSASSER, M.D.

LYMPH GLANDS AND LYMPHATIC VESSELS

D'Errico, G.: Primary Lymph Gland Tumors of Vascular Origin—Lymphangiothelioma of the Abdominal Lymph Glands (I tumori primitivi linfoglandolari di origine vasculare)—A proposito di un caso di linfangiotelióma delle linfoglandole addominali). *Riforma med.*, 1946, 60: 393.

There is still a great deal of confusion in regard to primary tumors of the lymph glands, some authors going so far as to say that all lymph gland tumors differ radically from each other and cannot be grouped into classes. Anardi's classification is probably the best. He differentiates between tumors originating from the parenchyma, including lymphoblastomas, lymphocytomas, and lymphomas; tumors originating from the stroma, including fibromas, lipomas, angiomas, fibrosarcomas, and sarcomas; and tumors originating from the blood or lymph vessels, including endotheliomas, peritheliomas, and reticulomas. The cell characteristics of these different groups are discussed and attention is called to the fact that angioma is a mature and benign tumor while endothelioma is an immature and malignant tumor.

In view of this confusion the detailed description of individual cases seems worth while. A case is described in a girl of 13 whose illness began about 6 months before admission to the hospital with pallor, loss of weight, and extreme fatigue on slight exertion. After some months enlargement of the abdomen was noted, with abdominal pain and diarrhea. Roentgen examination showed a tumor apparently at the hepatic flexure of the colon. Operation revealed a tumor of the size of a coconut at the hepatic flexure but not connected with the colon. Other round tumors varying from the size of a hazelnut to that of a large mandarin were scattered over the gastrocolic ligament with a few in the mesogastrium and omentum. They were removed and weighed altogether 1,200 gm.

Microscopic examination showed that the lymph gland tissue had been replaced almost entirely by tumor tissue, angiomatous in structure. There were many newly formed vessels, the smaller ones consisting of a simple endothelial tube with the surrounding tumor cells resting directly on its walls. The histological picture of these interstitial tumor cells was the same as that of the endothelial cells of the capillaries and the cells probably originated from an extravascular proliferation of the endothelial cells. The larger vessels contained leucocytes, which showed that this tumor had originated from lymph vessels rather than blood vessels. The tumor very clearly originated from the lymph glands of the abdomen and not from any of the abdominal organs. The peripheral lymph glands and the lymph glands of the thorax were not involved. The tumor showed mixed characteristics of the endothelioma and the perithelioma.

Photomicrographs of the histological findings are given.

In spite of roentgen treatment, the patient died a few weeks after the operation.

AUDREY G. MORGAN, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

White, J. C., and Hamm, W. G.: Primary Closure of Bed Sores by Plastic Surgery. *Ann. Surg.*, 1946, 124: 1136.

The authors summarize their experience in the cases of 9 patients with 14 bed sores in various areas over the sacrum, iliac crests, ischial tuberosities, and hips. The effect of malnutrition, protein deficiency, anemia, and avitaminosis is to retard wound healing. Consequently, a primary period of expert nursing care, plus constant effort to attain a satisfactory intake of calories and protein, whole blood, iron, and vitamins, in addition to the elimination of all sources of infection, will render the patient a better physical risk. When the mental and physical states are corrected, the sloughs begin to separate and the skin edges sprout out new epithelium. This is the time for radical operation. The most effective solution to this problem is excision of the ulcerated areas and closure by sliding in flaps which are brought together without undue tension. Penicillin is a very worth while adjunct.

The preoperative care consists of thorough cleansing of the lower bowel for several days. In preparation for the operation the patient is given 30,000 units of penicillin intramuscularly, and sedation with a barbiturate and morphine. No anesthesia is ordinarily needed. The infected scarred edges of the ulcer are first trimmed until vascular tissue is found. Occasionally, in order to do this, some bone must be removed. The flaps then may be single or multiple. They should lie in the direction of the arterial supply and they must be very accurately measured and cut. In none of the cases in this series was a delayed-flap method used. In the ulcers over the sacrum and coccyx the best doner area is the buttocks, the base being placed above and the tip extending to the subgluteal fold if necessary. It is wise to attempt to avoid having the flaps meet in the midline.

The best donor site for ulcers over the anterior superior spine is the skin just lateral to the spine on the side of the thigh, while to cover ulcers over the greater trochanter, a flap slid from the lateral surface of the buttock may be used. Absolute hemostasis is necessary. Closure is with buried catgut sutures, and with silk to the skin. Steel wire mattress sutures are used for reinforcing the skin sutures and a waste pressure dressing is then applied.

Postoperative care includes keeping the weight of the patient off the flap for a period of 14 days and giving penicillin intramuscularly in 15,000 unit doses every 3 hours. The patient is fed a low residue-constipating diet and liberal doses of paregoric for the first week, followed by an enema just before the first postoperative dressing. Most of the skin sutures are removed at that time, the wire tension sutures being removed on the twelfth or fourteenth day.

Experience proves that clean healing is the rule. Hematomas or undue tension result in defects. Frank sepsis occurred in only 1 case. This plastic procedure is successful only if adequate care is continuously given. LOUIS T. BYARS, M.D.

Marino, H.: Free Transplants of Skin; The Bandage Skin Graft (Injerto libre de piel: la venda cutánea). *Bol. Acad. argent. cir.*, 1946, 30: 451.

On the plastic surgical service of Finochietto the Padgett dermatome is used according to the author's directions. However, the grafts are not limited to the length of the drum in extensive grafting operations. The further end of the skin section is left attached and the drum reattached to the donor area further on after the cut graft is detached, or the drum of another machine is used if two are available, and the cutting is continued until grafts as long as 75 cm. in length are procured. These long strips of skin are wound as they are cut on to a glass tube and later handled just as a bandage would be. Such bandages are used in cases in which the entire circumference of the limb has been denuded of its cutaneous covering (nevae, burns). The strip of skin is not wound spirally around the limb, but is applied in single turns, which are stitched in place with nylon sutures, care being taken that the end lines of the suture do not coincide. A compressive dressing is then applied and then a plaster splint.

With this method the author has successfully grafted the denuded area, including the entire circumference of the arm and forearm, of a girl with an extensive nevus (Figs. 1 and 2); a third degree burn involving almost all the skin of the anterior part of the thorax; third degree burns (in two sessions with the Padgett dermatome) involving both the thighs and legs; a third degree burn in a boy 2 years of age, with two applications of the dermatome in one session; and, finally, in a case of a vicious cicatrix from a third degree burn involving the anterior as-

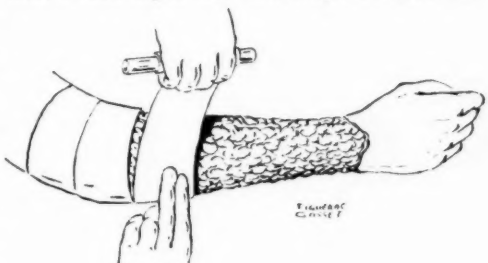


Fig. 1. (Marino) Placing the cutaneous bandage.

Fig. 2. (Marino). Result of the surgical extirpation and grafting of the cutaneous bandage.

pect of the throat and neck, the transplant being applied immediately after excision of the cicatrix.

JOHN W. BRENNAN, M.D.

Leveton, A. L.: The Surgical Principles of Split Thickness Skin Grafting. *J. Bone Surg.*, 1946, 28: 699.

The author gives an excellent description of the use of the split thickness skin graft. There are many technical points of interest in his experiences with the preparation, application, and postoperative care of the graft.

Split-thickness grafts can be used as follows: (1) in clean granulating surfaces; (2) over the yellow base left by the excision of granulations; (3) in extensive burns, crushing injuries, or avulsions, and in infections with loss of tissue, as soon as the granulating bed is clean; (4) over fresh raw surfaces, if subcutaneous tissues are still present in the floor of the wound; and (5) as an intermediate step before the application of a full-thickness graft in obliterating osteomyelitis cavities.

Obviously, the thicker the split-thickness graft, the better the coverage and the less the shrinkage. When it is laid on a freshly denuded scar base, on periosteum, or in an area surrounded by tense skin, shrinkage is less than if it is applied to a fresh raw surface or movable base. Should any question arise about the cleanliness of the recipient area, the surgeon would do well to err on the side of conservatism and choose a graft of lesser thickness, rather than risk the loss of a split-thickness graft.

In about 5 hours the graft is firmly attached to the base by the formation of fibrin, and leucocytes and fibroblasts begin their invasion of the clot. In about 18 hours the endothelial buds, arising from proliferation of the endothelium of the host of blood vessels, begin to invade the graft. Reichert demonstrated that the regeneration of small arteries across clean operative wounds occurs by the end of the second day, that veins and lymphatics become anastomosed by the end of the fourth day, and that the process is physiologically complete by the eighth day after operation. After the lapse of 2 or 3 months, the cellular infiltration disappears. The fibroblasts become mature compressed cells of fibrous tissue and lose their plump spindle shaped appearance. A layer of fat of variable thickness is now found to line the deep surface of the graft, permitting it to move freely over the underlying tissue.

Full normal sensation usually develops in free skin grafts; it is influenced by the amount of deep scar tissue that is left behind, and depends upon the presence of sensory nerves in the area and on the thickness of the graft. The sensations of pain, temperature, and touch may develop as early as in 5 weeks or as late as after several months.

Concerning the use of the Padgett dermatome, the author outlines several points of technical interest. The drum, brush, and the donor site should be absolutely dry; no trace of moisture may be present. It is well to go over the drum and the skin with ether to assure the dryness of these areas. The blade is placed in the instrument with the bevel away from the drum, and held in place by the clamp. It has been the author's practice not to use the same blade more than three times without having it sharpened. Cold sterilization is advocated. The cement is not poured until it is ready for use; if poured too soon, its volatile elements evaporate and the viscosity increases. The optimum viscosity of the cement is also a matter of importance. If too thick, ether should be added until the proper consistency is obtained.

On application of the adhesive, the drum is held in the left hand, with the back of the blade and the carriage resting on the operator's wrist. The brush should have fine bristles, from 1½ to 2 inches wide. The cement is applied to the drum in a thin layer with sweeping strokes. There must be no back and forth brushing; a thick layer of cement will dry unevenly and invite failure. The edge of the drum should be adequately covered with glue, as this is the edge at which the blade engages the skin. Good adhesion between the skin and the drum at this point is of the utmost importance. After application of the cement to the drum, and while the drum is still being held in the left hand, the donor site is painted with adhesive. The same precaution of smooth even application of the cement is observed. Drying can be hastened by gentle fanning with a folded towel. Failure of any steps necessary for the successful application and adherence of the cement to the drum and the skin calls for immediate cessation of the procedure, which must be started again from the beginning. This means that every vestige of cement must be removed from the drum and the skin. Should blood or moisture be present on the drum or the donor site, it is thoroughly removed and the area is dried by sponging with ether. The graft is not placed in saline solution before use but is merely placed in

the folds of a damp towel, or the cut surface is folded on itself. If the graft were allowed to soak in a basin of saline solution, the serum in the endothelial spaces would be washed out, small amounts of natural adhesive agents would be removed, and the take of the graft might be jeopardized. A solution of 0.5 per cent procaine, containing from 6 to 8 drops of adrenalin to the ounce, is used to infiltrate the scar bed. The adrenalin assures a dry bed until the graft has been sewed into place and the compression dressing applied. If the area will permit, a tourniquet is used and the adrenalin solution may then be omitted. Excision of the scarred area is now undertaken. This must be complete and the underlying normal tissue must be exposed. The area to be excised is outlined with gentian violet, 5 per cent brilliant green in alcohol, or Bonney's blue solution. Perfect hemostasis is obtained first, with the adrenalin solution or the tourniquet. A blood vessel that requires tying should be ligated with the finest silk obtainable, and the knot cut short.

It has been the author's practice to leave the granulating tissue in place if it is of recent origin and short duration. If the ulcer is old and calloused, it is advisable to remove the granulation tissue by sharp dissection—never by scraping—to the smooth yellow base which has a satisfactory blood supply. Strips of 3 per cent xeroform gauze are laid smoothly upon a large abdominal pad. The surgeon, without loss of time, places the pad over the donor site. Firm pressure is maintained and the whole area is bandaged snugly with a bias-cut stockinette bandage.

Postoperatively, the odor of suppuration or of pyocyaneus infection, or a persistent elevation of temperature should call for an immediate inspection of the graft. There is no adequate reason why the graft should not be inspected before the usually accepted 10 to 14 day period. There are definite advantages to inspecting the graft much earlier. If a small clot or a collection of serum or blood is present, that area may be saved by timely incision for evacuation of such fluid. If the wound is an early traumatic or an aseptic surgical wound, the graft is inspected on the sixth or seventh day. If it is a granulating wound, the graft is inspected on the third or fourth day. If the patient is febrile the graft is inspected at an earlier date. Upon inspection of the graft in the first week, it may present a mottled appearance. Some areas or the entire graft may appear cyanotic. This is not to be interpreted as death of the graft, but rather as incomplete vascularization and diffusion of the blood pigments. In such cases it is well to continue with moist dressings until all such discolorations disappear. Should the graft be dry, pink and adherent to the base, one may apply a layer of gauze (44 by 40 mesh), without wrinkles and impregnated with 3 per cent xeroform. Over this is placed a voluminous dry pressure dressing. This dressing is changed every 3 or 4 days for about 3 weeks. At the end of this period, all dressings are discontinued and 2 per cent boric ointment is applied to keep the graft and the surrounding skin soft. If there is any question about the status of the graft during the immediate postoperative period, one should at once revert to wet, voluminous pressure dressings.

C. FRED GOERINGER, M.D.

Gordon-Taylor, G., and Patey, D. H.: A Further Review of the Interinnominoabdominal Operation, Based on 21 Personal Cases. *Brit. J. Surg.*, 1946, 34: 61.

The authors review 21 cases in which these drastic operations were performed by them in the past 23 years. They have also made a chart which summarizes briefly the 73 cases which have appeared in the literature since 1935. In their own group of patients, 6 died shortly after surgery, 7 lived from 13 weeks to 5 years before they died of a recurrence, 5 are still well 1 or 2 years after surgery, and 3 are well 7, 11, and 17 years after surgery. All patients had some type of sarcoma, the most common being spindle cell sarcoma or chondrosarcoma.

Several aspects of the technique are discussed. The usual anesthesia is spinal; 10 c.c. of 1 to 1,500 nupercaine are combined with general anesthetics such as pentothal, nitrous oxide, and ether. The patient is placed in the lateral position for the iliac, inguinal, pubic, and gluteal portions of the operation, and on his back for division of the symphysis pubis. The Gigli saw is used for the bone section after division of the internal iliac artery and division of the psoas muscle have been accomplished. The external iliac artery is divided distal to the origin of the deep epigastric and deep circumflex iliac arteries to assure good vascular supply to the abdominal muscles. A catheter is in the urethra during and after surgery. Blood for transfusion is always available. The anus is kept out of the operative field by suturing cellophane or green protective over it. The procedure requires about an hour and ten minutes. In addition to the usual postoperative care, the patient is placed on a type of water mattress. Chemotherapy is used and the dressings are kept firm with elastoplast.

DANIEL RUGE, M.D.

Barclay, S.: Resuscitation by Cardiac Massage. *N. Zealand M. J.*, 1946, 45: 446.

The author reports the case of a 36 year old man who, while being subjected to intravenous pentothal anesthesia for tooth extraction, suddenly developed complete respiratory and circulatory paralysis. After 12 minutes of complete cardiac arrest spontaneous cardiac action was again resumed following transabdominal transdiaphragmatic cardiac massage combined with the intracardiac injection of adrenalin. Respiratory function returned and the patient lived 4½ days. Autopsy disclosed severe diffuse cerebral damage.

Twenty-nine minutes of cardiac arrest appears to be the longest recorded interval after which spontaneous heart beats have been resumed. A case from the literature is reported in which artificial respiration and cardiac massage were carried on for 20 minutes before spontaneous heart beats were resumed;

the patient had a perfectly normal recovery. Thus, under these conditions sufficient circulation may be artificially maintained to prevent serious brain damage. If following cardiac arrest the resumption of cardiac function, either by spontaneous action or by rhythmic cardiac massage, occurs within 4 minutes recovery is to be expected: but if the interval of cardiac arrest is longer than 8 minutes, recovery does not occur. F. J. LESEMANN, JR., M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Moore, F. D., Peacock, W. C., Blakely, E., and Cope, O.: The Anemia of Thermal Burns. *Ann. Surg.*, 1946, 124: 811.

The following etiological agents have been described as causative of the anemia of burns: external blood loss from infected granulations; early destruction of red blood cells due to heat; increased fragility of red blood cells; destruction of red blood cells due to anti-A or anti-B agglutinins in plasma; and suppression of the regenerative activity of the bone marrow by burn toxins.

In the present study the authors measured the red cell mass by the injection of donor cells containing radioactive iron, and quantitated the dilution or concentration of these cells by means of a Geiger counter. In this manner the selective destruction of donor and recipient cells was determined after a radioactive transfusion. By the injection of radioactive iron in the form of ferric ammonium citrate, failure of the latter to appear in the peripheral blood according to a normal predetermined pattern was used to measure bone marrow activity.

In 4 cases, studies were made of early hemolysis, internal red cell disappearance, peripheral blood correlation, radioiron utilization, reticulocyte response, and pigment excretion. False anemia due to hemodilution from increased plasma transfusions was distinguishable clinically by examination for the stage of edema formation or resorption, the urinary output, serum protein dilution, and indices of peripheral erythrocyte concentration. The latter conditions indicated the necessity of withholding fluids to enable renal excretion to complete edema fluid resorption.

The true anemia of burns was characterized as an anemia divisible into three stages. The first stage was associated with the trauma of the burn itself and the resultant initial hemolysis. Cell destruction under those circumstances was less than 10 per cent of the red cell mass. The second stage of anemia developed within 10 days of the injury. During this period as much as 250 c.c. of red cells were lost or destroyed daily. Following the latter there was often a short period of positive red cell balance. The third stage occurred in the third or fourth week, and was again characterized by a daily loss of 500 c.c. of blood. Significant amounts of blood were lost as a result of débridement, in the cutting of skin grafts, and through the open wound into the dressing, particularly during the separation of the burn slough.

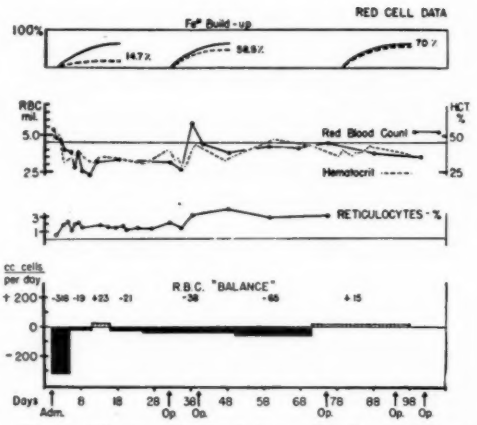


Fig. 1. (Moore *et al.*) Radioiron utilization, peripheral blood findings, and red cell balance showing an early and late progressive anemia in an extensively and deeply burned patient (78 per cent total, 45 per cent third degree). The radioiron utilization (Fe* build-up) is shown diagrammatically. The first test done on entry showed little elaboration into peripheral erythrocytes, correlating with the relative lack of reticulocyte response; about the thirtieth day marrow function had improved, evidenced by better iron utilization as well as increase of reticulocytes to 4 per cent. By the eighty-fifth day utilization was normal. The peripheral counts demonstrate an early profound anemia with relatively little reticulocyte response, followed about the thirty-fifth day by a rise with reticulocyte increase coincident with massive transfusion. Thereafter, nearly normal levels were maintained. The red cell balance shows an early massive red cell loss (internal destruction) followed by relative balance until about the fiftieth day when, for about 3 weeks, cell disappearance increased again. After this period a slightly positive balance obtained. (Courtesy of J. B. Lippincott Co.).

Although penicillin was used to combat infection, nevertheless there seemed to be a relationship between large open infected wounds and the true anemia of burns. Studies in radioiron utilization indicated suppression of bone marrow activity, disorders of iron metabolism, and delayed hemoglobin synthesis of both the hemin and globin fractions. The relationship of the alarm reaction to the anemia of burns may be a positive one, as suggested by the prolonged negative nitrogen balance and the negative potassium balance which were found in all but one case. BENJAMIN G. P. SHAFIROFF, M.D.

Connor, G. J., and Harvey, S. C.: The Pyruvic Acid Method in Deep Clinical Burns. *Ann. Surg.*, 1946, 124: 799.

The primary objective in the treatment of severe burns is the rapid closure of the burn wound since all physiological disturbances are traceable to the open condition of the wound. The main cause for delay in skin grafting after correction of peripheral vascular failure is associated with the time loss awaiting the

slough of dead tissue. The present report is devoted to a new chemical method for the local treatment of burns by the use of pyruvic acid which is intended to hasten the slough of burned tissue.

A stock or standard solution of pyruvic acid is made by the addition of 1 liter of distilled water to 7 c.c. of C.P. pyruvic acid to make a solution with a *p*H of 1.9. From the latter a paste is prepared by the addition of an 8 to 10 per cent volume of corn starch. The success of the surgical treatment of burns by this method is dependent upon the use of a thick layer of pyruvic acid paste in direct contact with the wound. A burn extending from the ankle to the leg ordinarily requires about 3,000 c.c. of paste, and first, second, and third degree burns can be treated under the same dressing and the same standard pyruvic acid paste. Preliminary cleansing and débridement of the wound are not done. Evaporation and drying of the paste should be prevented by the application of an impermeable retaining dressing of vaseline gauze. The first dressing is applied at any time but may be delayed during the phase of circulatory imbalance. The second dressing (first redressing) is made 2 or 3 days later in the same manner as previously. A characteristic feature of the wound at this time is the prominent demarcation of the dead tissue. At the third dressing beginning separation of the slough should be evident. The proper cleavage plane is sufficiently apparent so that further separation can be facilitated by section of the anchoring strands of dead connective tissue, and subsequent application of pyruvic acid paste will reach the remote areas of the burn.

In the present series, 30 burn cases were treated with pyruvic acid paste. The slough separated from the margin to the center of the burn and was removable in large sheets. Living islands of skin survived. Large deep thermal burns were ready for grafting within 10 or 12 days after the initial application of the pyruvic acid paste. With the removal of the slough there was a clean vascular surface ready for immediate grafting.

BENJAMIN G. P. SHAFIROFF, M.D.

Meleney, F. L.: Penicillin in the Treatment of Established Surgical Infections. *Ann. Surg.*, 1946, 124: 962.

The Subcommittee on Surgical Infections appraised the results of penicillin therapy as follows: (1) excellent, when response was obtained within 72 hours after the beginning of treatment, (2) good, when response was obtained from 7 to 10 days after the beginning of treatment, and (3) questionable, when the surgical procedure and associated therapy could have been the effective factors. In some cases the infection ran its usual course in spite of the use of penicillin. This classification was used by 6 groups of surgeons located in different parts of the country, reporting on 1,000 cases of established surgical infections. In this group there were 744 cases treated with penicillin. The data obtained from the case reports were transferred to the McBee System punch cards from which the following conclusions became apparent.

Penicillin, although of great benefit, was not a panacea. Favorable results were obtained in 65 per cent of the entire series of cases. Dramatic results were demonstrated in the patients receiving penicillin therapy for cellulitis and furunculosis. Unsatisfactory results followed its use in the treatment of empyema, burns, gas gangrene, and actinomycosis. When the cases are grouped according to their severity, (1) acute, (2) chronic with acute exacerbation, and (3) chronic, the impression is gained that penicillin is more effective in the acute than in the chronic cases. In the acute cases there is an important relationship between the character of the response and the time of the initiation of treatment. In this group of cases studied, 662 of the patients had serious infections and 384 had already received some form of sulfonamide therapy with favorable effects in 65.4 per cent. By the use of penicillin, surgery may be obviated in some types of surgical infections, while under other circumstances surgery is required in conjunction with penicillin to effect a cure. On the basis of results in relation to the methods of administration, particularly significant was the large proportion of cases controlled by the local application of penicillin. The adequate dosage of penicillin is defined as that amount which will control the infection and get the patient well. Nevertheless, it is directly dependent upon the number and vulnerability of the offending bacteria, the amount and penetrability of the infected tissue, and on the degree with which the drug is absorbed and excreted. The author believes that a maximum of 320,000 units of penicillin per day represents efficient therapeutic dosage which need not be exceeded. The acuteness or chronicity of the surgical infection is related to the bacterial flora of the purulent exudate. In acute infections one species of organism is usually found, while in chronic infections a mixture of organisms is recovered.

The bacteriologic studies included a bacterial classification of species, an aerobic or anaerobic identification, and a determination of pathogenicity. The first 4 principal bacterial groups were listed as the hemolytic streptococcus, the coagulase positive staphylococcus, the gram-negative aerobic and nonsporeforming rods (Escherichia coli, Aerobacter aerogenes, Pseudomonas pyocyaneus and bacillus proteus) and the Clostridium welchii. As a rule all of these groups were more frequently found in mixtures than in pure bacterial cultures. The largest percentage of excellent results was obtained in the pure staphylococcal infections. Aerobic cocci in pure culture responded favorably, while the anaerobic cocci and rods yielded unfavorable results. In patients with septicemia from the hemolytic Streptococcus an excellent response was obtained in 87.5 per cent of the cases, and similarly in 69 per cent of cases with Staphylococcus aureus septicemia. Analysis of the penicillin failures revealed them to be ascribable to resistant strains of staphylococci or streptococci, the insufficient or too late administration of penicillin, associated chronic debilitating disease (tuberculosis, diabetes, or arteriosclerosis), and finally overconservatism in surgery.

BENJAMIN G. P. SHAFIROFF, M.D.

Nichols, D. R., and Herrell, W. E.: Streptomycin. *J. Am. M. Ass.*, 1946, 132: 200.

The antibiotic agent, streptomycin, appears to have a place in the treatment of certain important bacterial infections. With few exceptions, the degree of sensitivity of organisms to streptomycin, as determined by in vitro studies, can be used as an index of the probable effectiveness of the treatment with streptomycin.

Satisfactory concentrations of streptomycin can be obtained in the blood and urine following intravenous, intramuscular, and subcutaneous administration. The antibiotic is not destroyed in the gastrointestinal tract and a large percentage of it can be recovered from the feces when it is given by mouth. After oral administration, however, streptomycin cannot be detected in significant amounts in the blood and urine of patients. Streptomycin may be administered locally. It also may be administered by means of intrathecal injection and it may be instilled into various body cavities. Streptomycin diffuses fairly readily throughout the body. It is excreted readily in the urine without evidence of a toxic effect on the kidney. The usual daily dose of streptomycin employed in the treatment of infections is 2,000,000 to 3,000,000 units (2 to 3 gm.).

From the analysis of the results obtained in the treatment of 104 patients who received streptomycin under the supervision of the authors, and from the analysis of the results obtained in an additional group of 88 cases, certain conclusions can be drawn.

Streptomycin appears to be of considerable value in the treatment of bacteriemia owing to gram-negative organisms sensitive to its action.

Streptomycin is of definite but limited value in the treatment of infections of the urinary tract. Best results are obtained when the organism of infection is Proteus vulgaris or Aerobacter aerogenes. Good results may be obtained at times when the organism of infection is Escherichia coli or Pseudomonas aeruginosa. Intensive treatment for a short duration appears to yield the best results.

Meningitis owing to Hemophilus influenzae usually responds satisfactorily to streptomycin. Additional treatment in the form of sulfonamides and antiserum may be indicated for this infection. Streptomycin appears to be of greatest value in the treatment of tularemia. It appears to be of definite value in the preparation of patients for pulmonary resection. Temporary or permanent eradication of sensitive organisms from the tracheobronchial tree at times can be achieved by its use. Temporary symptomatic improvement may occur from the use of streptomycin in the treatment of ozena. At this time final statements cannot be made concerning the value of streptomycin in the treatment of pulmonary and extrapulmonary tuberculosis.

Included among the infections in which streptomycin has proved of doubtful value are typhoid and paratyphoid fever, undulant fever, osteomyelitis, peritonitis, and cholangeitis.

Organisms at times may develop resistance to streptomycin with incredible rapidity. This has a tremendously important bearing on the clinical results obtainable following its use.

No serious uncontrollable toxic reactions have been encountered from the use of streptomycin in the cases herein reported. On the other hand, irreversible neurotoxic effects on the eighth cranial nerve may occur if treatment with streptomycin is prolonged.

Keefer, C. S., and Associates: Streptomycin in Infections. *J. Am. M. Ass.*, 1946, 132: 4, 70.

A study was made by 55 investigators, of the results obtained with streptomycin in the treatment of 1,000 cases of various infections. The discussions of these cases are concerned with the overall results in the various groups. The infections selected were: tularemia, hemophilus influenza infection, urinary tract infection due to gram-negative bacilli resistant to sulfonamides, typhoid, salmonella infections, acute brucellosis infection with bacteriemia, bacteriemia due to gram-negative bacilli, bacterial endocarditis due to gram-negative bacilli, and Friedlander's bacillus infection (Klebsiella pneumoniae). A study of tuberculosis was not made. The specifications for streptomycin which were made effective by the Food and Drug Administration of the Federal Security Agency on July 15, 1946 are given in full. The modes of administration, such as intramuscular injections, subcutaneous injections, intrathecal injections, oral administration, and inhalations, are described. The distribution in the body fluids and the excretion is also described. The results of treatment in these series are summarized in tables.

Following the tabulation of each of the results the authors make comments regarding the treated cases. They agree that streptomycin is an extremely effective agent in tularemia and that it is by far the best therapeutic agent for the treatment of this disease. In cases of bacteriemia it was apparent that streptomycin was important in controlling the infection and in reducing the fatality rate.

The prognosis in these cases, however, was determined to some extent by the severity of the local lesions, and many factors, such as the age of the patient, the site and extent of the initial lesion, the species of infectious organisms, the presence of complications, and the duration of the infection, had to be taken into account in assessing the results of the treatment with streptomycin. In some cases it was difficult to evaluate the precise role of streptomycin in bringing about recovery as the number of cases remains so small.

More extensive studies of streptomycin in the treatment of tuberculosis of various organs are necessary. A long range program should be planned and the patients should be followed up for a minimum period of 5 years. From the experience which has accumulated so far it appears that a minimum period of from 3 to 6 months of treatment will be required, and in some cases it will be necessary to treat patients for a longer time. Streptomycin has an inhibitive effect on the growth of the tubercle bacillus, and since the exudative lesions do not progress while the patient is under treatment, the agent should be helpful when it is combined with

other established methods for treating this infection. The authors show the range in sensitivity of gram-positive and gram-negative bacteria and of actinomyces to the bacteriostatic action of streptomycin, in a table, and the suggested dosages in another table. In summing up the dosage schedules it should be said that the optimum dosage is that amount which will bring the infection under control and assist in the sterilization of the focus of infection. Table XI gives the data on reactions while Table XII gives the occurrence times and duration of reactions.

The most frequent and disturbing neurologic reaction to the drug is vertigo, and its occurrence and duration in 33 cases is given in the original article.

The causes of streptomycin failures are: (1) the use of the drug in the treatment of infections which are not susceptible to its action; (2) inadequate dosage; (3) development of resistance to streptomycin in vivo; (4) changes in species of the infecting organisms during treatment, and (5) localization of infections in an area that cannot be reached by streptomycin. EMIL C. ROBITSHEK, M.D

DeBakey, M. E., and Pulaski, E. J.: An Analysis of the Experience with Streptomycin Therapy in United States Army Hospitals. *Surgery*, 1946, 20: 749.

This article reports the cumulative experiences with streptomycin used in the treatment of 706 patients in 30 army hospitals. The intramuscular injection of 400 mgm. of streptomycin at 4 hour intervals provided a level of 16 micro g. S units per cubic centimeter in the serum and a mean urinary level of 1,000 micro g. S units. Intrathecally, streptomycin was given in from 50 to 100 mgm. doses dissolved in isotonic saline solution. Orally, streptomycin was given in from 2 to 4 gm. daily doses divided over 6 hour intervals.

The largest single group (364) of the cases were those with urinary infections of the mixed type. Streptomycin was markedly effective against the Bacillus coli and the Friedlaender organisms. Therapeutic efficiency of the drug depended on the correction of urinary obstruction, retention of residual urine, and undrained abscesses. Streptomycin was especially indicated in gonococcal infection resistant to sulfonamides and penicillin.

The second group comprised 179 cases of wound infections with polymicrobial flora including staphylococci, streptococci, clostridia, the fecal type of gram-negative bacteria, Proteus, Pseudomonas aeruginosa. All these wounds were complicated by either chronic osteitis, or fibrosis with local anemia or infected recesses. Although in 40 per cent of the cases the condition was listed as improved, it was thought that the improvement was primarily the result of surgical wound revision.

The enteric diseases studied were dysentery due to the Shigella, nonspecific chronic ulcerative colitis, and epidemic diarrhea of infants. In ulcerative colitis, patients seemed to be temporarily benefited but sigmoidoscopy failed to reveal any improvement. The Shigella type of dysentery and epidemic infant diarrhea responded well to streptomycin. In peritonitis due to mixed infection of fecal origin, streptomycin appeared to be useful as an adjuvant to the regular surgical measures. Patients with bacteriemia were benefited by the use of adequate doses of streptomycin provided the foci were eradicable and the causative organism was sensitive to the antibiotic.

More intensive studies of streptomycin will be required to determine its efficacy in the treatment of tuberculosis which in this statistically insignificant series showed promise.

In brucellosis of the chronic type with inpenetrable foci of infection streptomycin was of doubtful value. In the treatment of meningitis, streptomycin was found potent provided that the organisms were of proved sensitivity and that the drug was administered intrathecally. Streptomycin was therapeutically effective when administered to patients with tularemia and to patients in the acute phase of typhoid fever before hidden foci developed. Patients with blastomycosis and pemphigus did not respond to streptomycin. Of a wide variety of reactions to streptomycin, the most unusual was that of disturbance of the vestibular apparatus which frequently produced permanent damage and necessitated stoppage of the drug. BENJAMIN G. P. SHAFIROFF, M.D.

ANESTHESIA

Barton, G. D., Wicks, W. R., and Livingstone, H. M.: The Effect of Pentothal Alone and in Combination with Oxygen or Nitrous Oxide-Oxygen on Arterial Blood Gases. *Anesthesiology*, 1946, 7: 505.

A clinical and experimental study was made to determine if there is any marked variation in the arterial blood gases in human beings and dogs under moderate pentothal anesthesia. Six patients and 6 dogs were utilized in the studies. Four arterial blood samples were taken from each patient and each animal; the first was taken prior to the administration of anesthesia; the second, after sodium pentothal anesthesia; the third, after combining mask inhalation of 100 per cent oxygen with pentothal; and the fourth, after administration of a mixture of 50-50 nitrous oxide and oxygen in addition to pentothal anesthesia. The oxygen and carbon dioxide were analyzed by means of the Van Slyke and Neill method. Pentothal was administered by the intermittent fractional dose method with a 2½ per cent solution.

In patients who had received premedication, a moderate depth of anesthesia produced no decrease in the blood oxygen after the administration of pentothal alone, but there was a significant rise in the blood oxygen after the combination of 100 per cent oxygen and pentothal.

Dogs without premedication and under pentothal alone showed a more marked fall in the blood oxygen, and a rise to or slightly above the initial values after 100 per cent oxygen or 50-50 nitrous oxide was administered.

The carbon dioxide values remained quite constant in each of the 4 arterial blood samples from dogs but showed a slight rise in those from patients, after the administration of pentothal. When 50-50 nitrous oxide was administered with pentothal the amount of pentothal required to maintain the same plane of anesthesia was only one-fourth of that necessary when pentothal was used alone or with oxygen.

The addition of oxygen or nitrous oxide oxygen to pentothal for anesthesia produces a definite increase in the blood arterial oxygen values. MARY KARP, M.D.

Beecher, H. K.: Resuscitation and Anesthesia. *Anesthesiology*, 1946, 7: 644.

The author's study is based on experience with resuscitation and anesthesia during World War II.

Every effort is directed toward a single aim, that of presenting to the surgeon a patient who will be as favorable an operative risk as possible. Several principles that are basic have emerged from, or have been tested in, the present conflict:

1. Reduction in the time from wounding to surgery means the saving of extremities, the minimizing of deformity, the shortening of convalescence, and the saving of lives. Every effort is bent toward reduction in evacuation time.

2. Economy of materials, of time, and of lives will be effected by preventing serious deterioration of the patient's condition.

3. Once rapid restoration of good blood color and a systolic blood pressure to an arbitrary level of about 80 mm. of mercury have been accomplished, the rate of infusion of blood or blood substitutes depends on several factors: (a) if blood for transfusion or operation will not be available for a matter of hours, infusion of plasma should be rapid enough only to maintain the aforementioned state; (b) if a patient must await surgery for a considerable period, even though blood may be available, as long as the systolic blood pressure is not below a level of about 80 mm. of mercury, the mucous membranes of good color, the skin warm, and the pulse of good quality, there is no need to administer further blood until surgery is available; (c) when surgery is available, further transfusion of blood is advisable so that a rising (or normal) blood pressure is achieved at the time the anesthesia is started.

4. Recovery from the damage produced by low blood pressure and by tissue anoxia probably requires many days. Practically, it is necessary to initiate the surgical procedure long before the consequences of shock can be fully overcome. Operation is undertaken as soon as experience has shown that the patient will tolerate it, indicated chiefly by a rising blood pressure (80 mm.) or above, a falling pulse rate, a warm skin and good color of the mucous membranes.

5. Resuscitation, as it is usually thought of, is only supportive. Surgery alone checks the consequences of the wound.

Resuscitation includes all methods of management of the wounded man that make him, first, transportable and then prepare him to meet the stress of essential surgery.

1. In the field, these methods are of the simplest order and have the single object of making the casualty transportable: (a) continuing hemorrhage must be controlled; (b) severe pain is the only important indication for the use of morphine, and when the relief of pain is urgent the intravenous route is the choice; (c) adequate immobilization of the wounded part, particularly when skeletal injury is suspected, not only prevents further local damage, but prevents shock; (d) food should not be given.

2. In the field or evacuation hospital the continuous service of one man in charge of resuscitation is desirable. General care in the preoperative ward includes: (a) head-down position for all patients when the systolic blood pressure is falling or is below 80 mm.; (b) the body heat of a wounded man is to be conserved by means of blankets; (c) oxygen therapy is instituted when cyanosis is present, when the pulse rate is unduly high, or when the wound itself may cripple cardiorespiratory function; (d) the administration of any fluid or food by mouth is generally contraindicated. Aspiration of vomitus is one of the most serious and common accidents to be encountered, and this may be precipitated by anesthesia; (e) glucose and saline solutions are useful only in the treatment of dehydration; (f) in the hospital where initial surgery is to be carried out, one unit of plasma to about three blood transfusions has been found desirable in preparing for, and carrying badly wounded patients through, operation.

The seriously wounded need very little premedication, and morphine should be avoided in most cases. Atropine is useful to decrease the flow of mucus under ether and to minimize vagal reflexes. When local anesthesia is to be employed, if pain and considerable discomfort are to be anticipated, morphine may be used.

Three agents fulfill all of the important requirements of military surgery: ether, sodium pentothal, and procaine hydrochloride.

Ether has clearly emerged as the agent of choice for the seriously wounded, for the man in bad condition, and for long operations.

Acceptable practice in the employment of sodium pentothal includes the use of a 2.5 per cent solution, the routine administration of oxygen with it, and frequent observation and recording of pulse rate and blood pressure levels. A method of reducing the total quantity of sodium pentothal used is to supplement the agent with 50 per cent nitrous oxide and 50 per cent oxygen. Sodium pentothal is useful for 30 to 45 minutes, or less, of anesthesia in the lightly wounded and when employment of a noninflammable agent is imperative. Spinal anesthesia has few indications in surgery in forward areas.

Intratracheal intubation under general anesthesia is especially desirable for intracranial, maxillofacial, thoracic, and abdominal surgical procedures, and in other cases when the position of the patient makes it difficult to maintain a good airway.

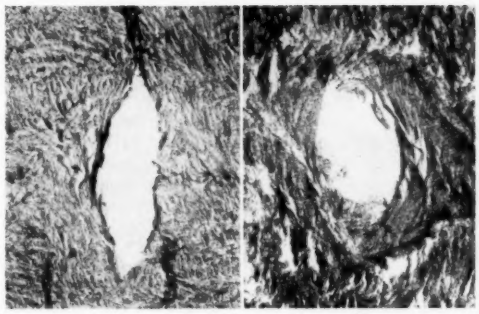
The routine use of postoperative bronchoscopy, even in open thoracic cases, is undesirable.

MARY FRANCES POE, M.D.

Franksson, C., and Gordh, T.: Headache after Spinal Anesthesia and a Technique for Lessening Its Frequency. *Acta. chir. scand.*, 1946, 94: 443.

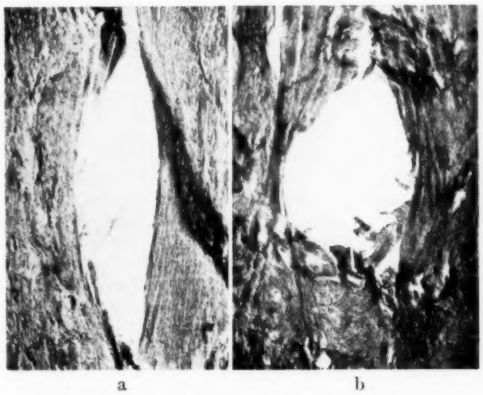
One of the most common and important complications of spinal anesthesia is the headache which sometimes occurs after operation. In most tabular summaries the incidence is between 15 and 30 per cent and most common in female patients younger than 40 years of age.

Two types of headache can be distinguished. One is characterized by increased intradural pressure—a rare type in which the ache is of a splitting character and does not react favorably to the patient lying in bed with the head end lowered. The second and more common type is characterized by a reduced intradural pressure. It is marked by a bandlike oppressive ache around the head sometimes more pronounced in the forehead or nape, usually aggravated by movement, and often combined with vertigo. It tends to diminish when the patient keeps quiet and lies with his head low. It is considered that the headache in such cases is caused by the reduced intradural pressure. This reduction in pressure may be caused by diminished production, increased resorption, or leakage of the spinal fluid. Changes in production and resorption may be precipitated by irritation caused by the anesthetic or the needle. To judge by the authors' investigation, the chief cause that induces a headache or reduces the intradural pressure seems to be connected with the needle and puncture procedure, that is, leakage of the cerebrospinal fluid into the epidural space. The authors have demonstrated that such leakage occurs and in autopsies have demonstrated that the dural puncture opening had been open for 2 weeks or longer. They believe that an attempt should be made to reduce the leakage at the puncture opening in the dura, and that the ordinary puncture needles are too large in diameter (from 0.7 to 0.9 mm.). They point out also the importance of the angle at which the point of the needle is held during the perforation of the dura and the importance of placing the beveled part parallel with the direction of the fibers of the dura whereby a narrow slotlike opening will be obtained with a greater tendency toward contraction. They contrast this with placing the beveled part at right angle to the longitudinal fibers whereby the fibers are cut off with a diminished prospect of closing the opening rapidly. They find by actual count that the number of fibers broken when the bevel is at right angles is twice that when the bevel is placed parallel to the fibers. They also find that the number of fibers torn off is directly proportional to the diameter of the needle. They believe that a relatively small opening is produced by a needle 0.5 mm. in diameter, especially if beveling is placed parallel with the longitudinal direction of the dura fibers, a finer needle causing less and less protracted leakage.



a b

Fig. 1. (Franksson and Gordh) Sections in the plane of the dura after puncture. a, The beveling of the needle parallel with the longitudinal direction of the dura fibers; b, the beveling of the needle at right angles to the longitudinal direction of the dura fibers. Diameter of needle 0.5 mm. (x 50).



a b

Fig. 2. Sections in the plane of the dura after puncture. a, The beveling of the needle parallel with the longitudinal direction of the dura fibers; b, the beveling of the needle at right angles to the longitudinal direction of the dura fibers. Diameter of needle 1.0 mm. (x 47).

The authors suggest the use of a fine needle (a special needle with introducer, called Antoni-Sise needle) of 0.5 mm. diameter. They describe the technique of inserting the "introducer" first and then through this the fine needle. By this procedure they find that spinal anesthesia headache has been very considerably reduced and that no prophylactic measures regarding position are necessary.

G. ALBIN LIVA, M.D.

Harmel, M. H., and Lamont, A.: Anesthesia in the Surgical Treatment of Congenital Pulmonic Stenosis. *Anesthesiology*, 1946, 7: 477.

The authors present an account of their experience in the administration of anesthesia in 100 patients

operated upon by Alfred Blalock for the relief of congenital pulmonary stenosis or atresia.

They state that the condition for which these patients undergo operation is, essentially, an insufficient flow of blood through the lungs due to pulmonary stenosis or atresia associated with the other stigmata of the tetralogy of Fallot, with other congenital abnormalities, and their sequelae. A compensatory polycythemia has developed, and marked changes in the oxygen and carbon dioxide content of the arterial blood are found. It is obvious that most patients have a small cardiac reserve, and the physical activity is usually extremely limited.

The preanesthetic medication has usually been morphine and atropine, given 90 minutes before the beginning of anesthesia, although on occasion nembutal instead of morphine has been used, or scopolamine instead of atropine. The authors like to have the patients so depressed that, if undisturbed, they will fall asleep. Venous cannulation and other painful or disturbing procedures are done after the induction of anesthesia.

The operation consists of making what amounts to an artificial ductus arteriosus by anastomosing one of the arteries arising from the arch to one of the main divisions of the pulmonary artery. Most of these patients seem to tolerate the partial collapse of one lung fairly well. Serious trouble, if it comes, more often starts when the anastomosis is begun, although not infrequently the exploration, or even just the opening of the pleural cavity, has been sufficient to weaken the action of the heart.

For induction, cyclopropane is usually chosen because it permits a rapid smooth induction and a high oxygen tension. Vinethene and nitrous oxide have also been successfully used.

For maintenance with the closed to-and-fro absorption technique, cyclopropane alone was used 56 times, and ether alone was used 15 times. In 32 patients, a moderate amount of ether was added to the cyclopropane throughout the greater part of the procedure. Since the authors find it very much easier to provide a quiet operative field with cyclopropane, they state that they are more likely to use that agent.

In the authors' experience, the maintenance of positive pressure in the respiratory tract during both expiration and inspiration does not produce a sufficiently quiet field. The use of "controlled respiration" or of pressure on the breathing bag during the inspiratory phase of respiration better serves to maintain adequate tidal exchange and to relieve the patient of some of the muscular effort of breathing, factors which are of some importance.

Although 6 cases were managed without the insertion of an endotracheal tube, the authors much prefer to use a tube. The endotracheal tubes always fit tightly enough without cuff or pack so that at the pressures employed there is no appreciable leak. For all of the cases, when the closed technique was used a Foregger apparatus equipped with their water manometer has been employed. The manometer is set to blow off at 8 to 12 cm. of water pressure.

In the cases of most children, the induction proceeds at normal speed. There should be no hesitation in postponing the operation if there are any serious complications during the induction or if the patient does not react normally to the anesthetic agent.

A weakening of the cardiac action appears to be the commonest complication with either ether or cyclopropane. This complication occurred 5 times with ether, 19 times with cyclopropane, and 15 times when both agents were used together. This complication was encountered in 42 per cent of the patients in whom the operation was on the right side, and in 24 per cent of the patients in whom the operation was on the left side. Whenever it occurs, the operation is interrupted if possible, the retractor holding the ribs apart is released, and the lungs are reinflated.

The pulse rate varies considerably. There seemed to be no significant difference according to the agent used. The blood pressure also varies in no consistent fashion. The pulse pressure is usually reduced and has frequently been as little as 10 mm. of mercury. Minor cardiac arrhythmias, usually transient, have been noted in 12 anesthesias (11 patients). Respiratory complications during operation have not been very frequent. In 5 instances it was thought that bronchiolar constriction might have been present. Traction on the pulmonary artery has seemed to initiate the obstruction several times. Not infrequently when the anastomosis is opened there is a fairly sharp fall in both the systolic and diastolic pressure, with an increase in pulse pressure and pulse rate. The pressure usually rises again within 15 minutes. The tachycardia may persist for hours or days.

It is obvious that a successful anastomosis, when permitted to function, will immediately increase the flow in the pulmonary vessels and the work on the left side of the heart. It is surprising that these changes have not more frequently caused pulmonary edema and heart failure. Another possible complication resulting from the alteration in the hemodynamics is bleeding from the lungs. Sixteen patients have shown signs of interference with the flow of blood to the brain after operation.

As compared to the resting unanesthetized values, after 10 or 20 minutes of anesthesia the oxygen content, oxygen saturation, and carbon dioxide content rose and the oxygen capacity fell. From 6 to 20 minutes after the operation had ended, the oxygen content, the saturation, and carbon dioxide content were less than during anesthesia but still higher than before anesthesia, and the oxygen capacity was lower than during anesthesia. It is thought that a considerable rise in oxygen saturation which accompanies the administration of an anesthetic atmosphere rich in oxygen is an important factor in the ability of the patients to withstand operation.

Twenty-three of the 100 patients died. The mortality rate was lower in those patients between 6 and 10 years of age. The duration of the operation appeared to have no influence on the mortality rate.

A larger proportion of the patients died when the innominate artery was selected for anastomosis. Fewer patients died when cyclopropane alone was used.

If those patients who received ether and cyclopropane together are grouped with those who received cyclopropane alone, the combined mortality rate is not significantly different from the mortality rate in those patients who received ether alone for the maintenance of anesthesia.

The authors believe that the hazards inherent in the physical condition of the patients and in the delicate operation have been of greater influence than the anesthetic factors.

MARY FRANCES POE, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Jenkins, H. P., Senz, E. H., Owen, H. W., and Jampolis, R. W.: Gelatin Sponge for the Control of Hemorrhage. *J. Am. M. Ass.*, 1946, 132: 614.

After a short survey of the work done by others and by themselves in the past concerning absorbable spongelike hemostatic agents, the authors report first a series of experiments on animals.

In 12 dogs substantial parts of the liver were resected and the defects "blanketed" with gelatin sponge which was fixed with pressure for from 5 to 10 minutes. This controlled the hemorrhage. Two of the animals died later from biliary peritonitis. Studies of the healing showed that the sponge, unlike foreign bodies in general, appeared to promote the healing process.

Massive hemorrhage from wounds in the vena cava of 27 dogs could be controlled by a "patch" of gelatin sponge applied with finger pressure. The patch becomes endothelized, and the wall defect healed with an endothelized scar within about 2 weeks. The fact that in 1 case a large mural thrombus was observed suggested the use of anticoagulants when one is attempting to stop massive venous bleeding by the use of gelatin sponge in human beings.

Rents in large arteries were patched similarly in dogs, but a sheath of chromicized catgut was found necessary to prevent blowouts. In these experiments propagating thrombosis was encountered once.

Stab wounds of the heart were similarly treated, and it was found that gelatin sponge patches, held to such wounds for about 10 minutes, became adherent and stopped the hemorrhage.

The gelatin sponge was used in 140 clinical cases, and it was found useful on the liver after cholecystectomy and biopsy, in thyroidectomy, near the recurrent nerve, in the abdomen after freeing of the adhesions, in the chest, after excision of the thickened pleura, or removal of mediastinal tumors; it was also found useful after biopsy of abdominal tumors. Furthermore, it is useful in skin grafting, on donor areas, and after removal of granulations; it can be used as packing after rectal operations, as nose packing in recurrent nose bleeding, and after tooth extractions.

Gelatin sponge is not supposed to be used when hemostasis by clamp and tie will work satisfactorily. It is mainly used at this time when these methods fail or when their use entails danger. It should also serve well as a first aid dressing.

Extensive venous hemorrhage during removal of an organ or a tumor cannot ordinarily be stopped with clamps, and requires gauze packs; however, the removal of these packs may start new bleeding. Gelatin sponge needs not be removed, which obviates the danger of secondary hemorrhage. Up to this time extensive abdominal resections could be done safely only when unlimited amounts of blood were available for replacement of the blood lost during the operation. Gelatin sponge may help to reduce such losses, and thus surgeons in places where unlimited amounts of blood are unavailable may now attack problems they have avoided in the past. Liver surgery will be helped greatly by the new material, as will work on the bile ducts or the pancreas. Gelatin sponge will be of value in injuries of the portal vein, in neurosurgery for bleeding from the dural sinuses, in the "cuff" technique, mentioned in the animal studies, for the repair of arterial wounds, and for "patches" to be used on heart wounds.

As to the mode of action, the authors believe that the gelatin sponge acts as a framework for the clot, and is finally absorbed. They have not been able to establish what effect, if any, preliminary wetting of the sponge with thrombin has on its efficacy, but they recommend the use of thrombin with the sponge in clinical cases. HEINRICH LAMM, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Heublein, G. W.: Some Observations Concerning the Hypophysial Fossa. *Am. J. Roentg.*, 1946, 56: 299.

The pituitary fossa of 100 apparently normal young adult soldiers was measured. Its average anteroposterior diameter was found to be 10.66 mm. and its average depth 8.30 mm. The largest fossa measured 13 by 9 mm. and the smallest 8 by 5 mm. This agreed closely with the measurements reported by Kornblum.

The average size of the fossa in 6 cases of pituitary adenoma was 23 by 17 mm.

Various normal anatomical variations of the sellar configuration are discussed. The shape and the calcium content of the dorsum sellae are influenced by (among other factors) the basilar sinus (described by Batson and Kornblum). The sphenoparietal sinus or sinus of Berschet—another venous sinus of importance in the reading of roentgenographs of the sella—may be mistaken for an enlarged channel of the middle meningeal artery. Other vascular channels may simulate fractures through the sella.

Intrasellar calcium deposits are not necessarily of clinical significance but suprasellar calcifications (above the diaphragma sellae) raise the suspicion of Rathke's pouch tumor or other pathological changes.

Case descriptions illustrate sellar changes caused by various pathological conditions. Extreme calcification of the petroclinoid ligaments was caused by a parathyroid tumor. Various changes in shape and size of the sella were caused by pituitary adenomas in 6 instances. They were associated with restricted visual fields. Choked discs were absent, however. A malignant chromophobe adenoma of the pituitary gland caused intrasellar as well as perisellar changes. An enlarged third ventricle (caused by a large pinealoma) flattened the clinoid processes from above and caused "cupping" of the upper superior margin of the dorsum sellae. Similar changes were caused by a narrowing of the aqueduct with consequent third ventricle enlargement due to ependymitis in one case and due to a large frontal cystic astrocytoma in another instance. (There was no direct influence of the tumor on the sella.) A large parasellar bone erosion was caused by a lymphepithelioma (nasopharyngioma). Erosion of the sella by metastatic tumor was seen only in 1 of 360 cases of malignant disease treated in the radiotherapy department of the Percy Jones General and Convalescent Hospital in 1944, although 21.9 per cent of these cases had evidence of tumor metastases. In this single case the etiology was multiple myeloma.

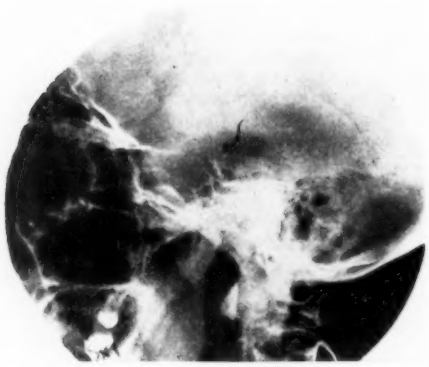


Fig. 1. (Heublein) Characteristic appearance of the hypophysial fossa in a patient with pituitary adenoma. The thinned and apparently elongated dorsum sellae is shown by the arrow.

Aneurysms of the circle of Willis may cause sellar deformities. Usually, however, they are recognized by their calcium content (to be distinguished from vascular sclerosis without aneurysm) or by means of angiography.

A pitfall in the diagnosis of sellar erosion is decalcification due to pulsation of the brain transmitted to the sella through the basilar sinus, to senile atrophy, to minute basophilic adenomas, and possibly due to a persistent rest of notochord, the so-called physaliform ecchondroma. A faulty roentgenographic technique may reveal restitution of the sella following deep roentgen therapy whereas correct roentgenographs will fail to show changes.

GERHART S. SCHWARZ, M.D.

Pendergrass, E. P., and Perryman, C. R.: Porencephaly. *Am. J. Roentg.*, 1946, 56: 441.

According to the authors, porencephaly is the end point of many disease processes. It is usually defined as a defect communicating with the ventricles or separated from them by a layer of brain tissue, and covered on the outside by the arachnoid. This condition must be considered in the differential diagnosis of mass or contracting lesions involving the brain. Occasionally it is confused with cystic lesions. Encephalography or ventriculography is necessary to establish the diagnosis of the condition. Roentgenologically, the types of porencephaly have been classified as "lobe," "interlobe," and "hemisphere."

In the series of 29 cases studied, the average age of the patients was 16 years, the oldest being 34 years and the youngest, 9 months. The duration of symptoms varied from 3 months to lifetime (30 years).

Most of the patients (26) sought medical attention because of epileptic attacks, which usually had been preceded for several years by other symptoms such as weakness of an extremity, strabismus, or mental retardation. Others complained of headache, poor

memory, irritability, sluggishness, and excitability. Sixteen of the patients in the series had paresis of one or two extremities, and 2 of these had facial paralysis as well.

Atrophy or hypodevelopment of one-half of the body or the involved extremity was present in those who had had paralysis since early childhood. Occasionally anesthesia was present. Papilledema was present in 3 patients. Four patients had homonymous hemianopsia and bitemporal hemianopsia. Peripheral constriction of the visual fields was noted in one patient. The symptoms were dependent to a large extent upon the location of the lesion. Unilateral change in thickness of the skull was the most common observation in the conventional reontgenograms of patients with porencephaly. Generalized or localized thinning was most frequently present, and unilateral thickening of the vault was less often demonstrable. Asymmetry of the vault was also occasionally observed. Calcification similar to that in malignant gliomas was found in one instance.

FRANK L. HUSSEY, M.D.

Pendergrass, E. P., and Perryman, C. R.: Optochiasmatic Arachnoiditis. *Am. J. Roentg.*, 1946, 56: 279.

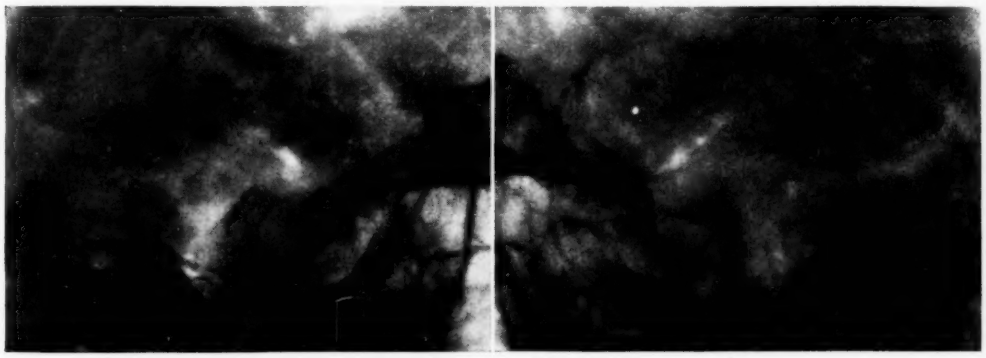
Ten cases of optochiasmatic arachnoiditis are reported in which the pneumoencephalograms showed incomplete filling, and distortion or blurring of the cisterna chiasmatica and/or of the neighboring cisternae interpeduncularis and pontis.

Five patients had visual disturbances and optic nerve atrophies. Operation revealed arachnoiditis involving the chiasma in 4 of them (luetic in nature in 1 instance), and a small suprasellar meningioma in 1 patient. None of these showed sellar changes.

The other 5 patients had no eye symptoms or changes. Of these, 4 suffered from epileptic convulsions and 1 displayed post-traumatic headaches and weakness in the right arm and shoulder. Craniotomy performed in 1 instance showed a microscopically fresh blood clot. In this group the encephalogram showed a decrease in the number of subarachnoid pathways in addition to cisternal changes. In some of the latter cases the escape of cerebrospinal fluid through the foramina of Magendie and Luschka was apparently interfered with by arachnoid adhesions causing dilatation of the ventricles.

The authors conclude that a careful pneumoencephalographic study of the cisternae will lead to the diagnosis of perichiasmal arachnoiditis more frequently than is generally anticipated.

c (*Legend below*)



a b

Fig. 14. (Pendergrass and Perryman) a, The lateral encephalogram demonstrates cisternal adhesions; b, shows a generalized obscuring of the cisternae; and c, shows a variation in the size and number of cortical pathways.

Difficult differential diagnostic problems are posed by tumors and by inadequate filling of the cisternae with air due to technical factors. Because of this the air has to be introduced through a lumbar puncture and not through the cisterna magna. The entire aspirable fluid has to be replaced by air. The filming must be done with the radiation directed horizontally while the patient's head is placed against a vertical grid in prone, supine, and erect position.

The normal roentgenographic appearance of the pertinent cisternae is described in detail.

GERHART S. SCHWARZ, M.D.

Hodges, P. C.: Heart Size from Routine Chest Films. *Radiology*, 1946, 47: 355.

The author in the first of 2 articles concerning the determination of the size of the human heart describes the events leading up to the work reported in the second article. Two equations listed are reproduced:

1. $F=\left(1-\frac{K}{D}-\frac{C}{3D}\right)^2$, in which F equals the divergent distortion correction factor; K equals the distance in centimeters between the anterior surface of the chest and film (in this apparatus, 2.5 cm.); D equals the distance in centimeters between the target of the x-ray tube and the surface of the film (in this apparatus, 183 cm.); C equals the anteroposterior diameter of the chest in centimeters, which varies from approximately 5 cm. to 28 cm., according to the patient).

2. $A=0.87H+0.34\ W-63.8$, in which A equals the frontal plane area of the heart in square centimeters; H equals the subject's height in centimeters; and W equals the subject's weight in kilograms.

FRANK L. HUSSEY, M.D.

Schwarz, G. S.: Determination of the Frontal Plane Area from the Product of the Long and Short Diameters of the Cardiac Silhouette. *Radiology*, 1946, 47: 360.

The author of the second article studied 99 teleroentgenograms of subjects of varying ages and of both sexes to determine a simple method to compute the frontal plane area of the heart from measurement of the long and the short diameters of the cardiac silhouette. The films were of 25 normal individuals and 68 individuals with evidence of heart disease. For each case the product of the long diameter of the cardiac silhouette in centimeters and the short diameter of the cardiac silhouette was divided into the area of the silhouette (as measured by planimeter) to obtain factor F.

For the normal cases the mean value of F was 0.740 and for the abnormal cases 0.730; the medial 0.735 was therefore chosen as the factor for general application. On this basis, the equation of calculation of the frontal plane area from long and short diameter becomes $A=L\times S\times 0.735$.

A equals the gross frontal plane area of the heart in square centimeters in full sized roentgenograms made with the patient facing the film at approximately 72 inches target film distance. Predictions by the ellipse formula were larger than the actual measured area, while the predictions by use of the formula varied from slightly larger and slightly smaller. The deviations of calculated values obtained by the ellipse formula from the measured values were greater than those obtained by the formula $L\times S\times 0.735$.

The accuracy of both formulas was also computed by statistical methods.

On miniature films the factor of linear minification M is obtained from: $M=\frac{I}{i}$, in which I equals length in centimeters of an image on the fluorescent screen and (i) equals the length in centimeters of the corresponding microfilm image.

The minification factor for a particular apparatus may be measured as follows: a strip of lead pierced with two small holes spaced 10 cm. apart is attached to the front surface of the hood. Target screen distance (D) and object screen distance (d) are measured. In the image (I) that will be developed on the fluorescent screen, the distance between the 2 holes will be $10\ cm.\times(D/D-d)$. The microfilm is made and (i) is measured on the film. By substituting in the above equation the computed value of (I) and the measured value of (i) the linear minification factor is obtained.

In the case of miniature film, the equation for computing the gross frontal plane area, A becomes $A=L\times S\times 0.735\times M^2$, in which M is the factor of linear minification.

In the working up of teleroentgenograms it is possible to avoid use of the planimeter and compute the frontal plane area by measurement of the long and short diameters of the cardiac silhouette and applying the formula: $A=L\times S\times 0.735$.

FRANK L. HUSSEY, M.D.

Porta, C.: Roentgen Study of Intrathoracic Neurinoma (Contributo allo studio radiologico del neurinoma intratoracico). *Radiol. med.*, Milano, 1946, 32: 281.

It has been claimed that the diagnosis of intrathoracic neurinoma is impossible, but the author believes that he has demonstrated in 3 cases that the diagnosis is possible by means of roentgen examination, supplemented, if possible, by stratigraphy and diagnostic pneumothorax. Illustrative roentgenograms are given in the original article.

His first case was that of a woman of 42 years who complained of intermittent lancinating pains in the right posterior costal region. Roentgen examination showed an oval shadow the size of an egg in the right paravertebral region at the level of the seventh, eighth, and ninth thoracic vertebrae. The opacity was uniform and intense. There was no pulsation of the outlines and no change in form with respiration. Stratigraphy showed that it was back of the lung and independent of the ribs and vertebrae. Diagnostic

pneumothorax showed that the upper part of the right lung was completely collapsed and the lower part partially so. The mass was independent of the lung and visceral pleura. On the basis of these findings a diagnosis of paravertebral tumor was made, probably neurinoma. Operation revealed a paraganglioma.

The roentgenogram and stratigraphy showed the posterior location of the mass, and thus excluded any pathological condition in the anterior mediastinum; the collapse of the lung shown by pneumothorax excluded a tumor of the lung or sacculated pleurisy. The differential diagnosis was therefore limited to aneurysm of the descending aorta, bone abscess, echinococcus cyst of the pleura, or true tumor. The paravertebral rather than prevertebral site of the tumor and its independence of the thoracic aorta, which was normal throughout its course, excluded aneurysm. A bone abscess was excluded by the fact that the vertebrae and ribs were intact. An echinococcus cyst is lower down and usually causes pleural reactions, and the shadow of an echinococcus cyst is not so dense as this shadow was and its outlines are not too distinct. The slow course of the tumor, the relatively good health of the patient, and the absence of enlarged glands indicated that the tumor was benign. The chief benign tumors at this site are neurinomas. Sometimes they are hourglass shaped, one part being intravertebral and a larger part, after passing through the vertebral foramen, being intrathoracic.

The 2 other cases examined were similar to the one described. AUDREY G. MORGAN, M.D.

Cossali, C., and Bignami, C.: Radio Transparent Striae of Bone and the Looser-Milkman Syndrome (Strie di radiotrasparenza nelle ossa e sindrome di Looser-Milkman). *Radiol. med.*, Milano, 1946, 32: 317.

A study of 4 cases of osteopathy with transverse striae of radiological transparency revealed an involvement of the whole skeletal system except the skull and vertebral column with predilection for the diaphases of the long bones. The striae are not characteristic enough to enable the roentgenologist to determine the nature or origin of the lesion, although he can distinguish the image from that of a fracture. The anatomical and histological study is the only one which allows the proper interpretation of the pathological process demonstrating the presence of a periosteal formation of bony substance with osteoblasts and osteoclasts, and islands of cartilaginous tissue. Sometimes the appearance of noncalcified lamillae allows the conclusion that the lesion is caused by a lack of calcium from general causes, such as an alteration of the calcium, phosphorous, and vitamin D metabolism. The blood picture is represented by an increase of serum phosphatase which is a complement to other bone pathology due to avitaminosis.

This type of osteopathy can be divided in 2 groups. The first may be secondary to other primary conditions, such as osteopsathyrosis, syphilis, hyperthyroidism, sprue, poisoning with chemical substances, osteomalacia, and rickets, while the second group is the specific syndrome of Looser-Milkman. Radiological transverse striae are usually symmetrical, more prevalent in women, and probably caused by ovarian deficiency or the menopause.

Clinically, the symptomatology is meager, being characterized by dysbasia and pain. The administration of large doses of calcium, phosphorus, and vitamin D causes rapid disappearance of the clinical signs and x-ray findings. ARTHUR F. CIPOLLA, M.D.

Mossberg, H.: Two Cases of Allergylike Reaction with Hemorrhagic Diathesis following Roentgen Treatment (Zwei Faèlle von allergie-aehnlicher Reaktion mit haemorrhagischer Diathese im Anschluss an Roentgenbehandlung). *Acta radiol.*, Stockh., 1946, 27: 400.

The author reports 2 cases of hemorrhagic diathesis following x-ray therapy.

The first case was that of a 62 year old male suffering from myasthenia gravis who received 3,200 r. in 8 fractionated doses to an anterior mediastinal portal for treatment of the thymus. On the last treatment day, skin hemorrhages began to appear which disappeared and reappeared repeatedly until the patient expired approximately 4 months later with signs of dyspnea, dysphagia, tachycardia, and blood tinged expectoration. The lowest platelet count was 23,000 and was taken between the fourth and eleventh days after completion of the radiation treatment. Five weeks later the thrombocyte count had risen to 200,000. The bleeding time was once reported as 30 minutes and the coagulation time as 3¼ minutes. The autopsy revealed questionable myasthenia gravis, hyperplastic mediastinal lymph nodes, and cardioarteriosclerosis.

The second case was that of a 75 year old woman treated for carcinoma of the esophagus, located near the tracheal bifurcation. Her mediastinum was irradiated through 6 portals with fractionated doses of 600 r. each. The total skin dose varied between 1,800 and 2,400 r. Six days after suspension of the treatments (on account of progressive weakness), an urticaria (which looked like an eruption with edema of the eyelids and lips), cyanosis, and itching occurred; this was most marked over the treated skin areas. On the next day petechiae appeared. The urticaria disappeared a day later but the hemorrhagic manifestations continued to progress. Finally, on the seventh day of her illness the patient expired with signs of a hemorrhagic bronchitis. The lowest reported thrombocyte count was 98,000. The prothrombin index sank from 174 to 71. The blood calcium was given as 8.4 mgm. per cent, the coagulation time as 2.5 minutes, and the bleeding time as 2.5 minutes on one occasion. The autopsy showed carcinoma of the esophagus, mucopurulent bronchitis, and purpura.

A careful review of the existing case reports is of interest. Two principal schools of thought seem to be prevalent. According to one, thrombopenia is the

cause of the reaction, and according to the other, allergy to liberated (decomposition) toxins is the cause. The author noted that, in addition to his own cases, there were 5 instances in which the radiation had been directed to the trunk over an area in which the red bone marrow was affected. He concludes that at least in his cases allergy was the causative factor but that a hypersusceptibility of the bone marrow to radiation must have pre-existed and that had led to the thrombopenia.

GERHART S. SCHWARZ, M.D.

Piemonte, M.: Histopathogenetic Considerations of Radionecrosis (Considerazioni istopatogenetiche sulla radionecrosi). *Radiol. med.*, Milano, 1946, 32: 192.

Late radionecrosis is well known in its clinical aspect today, the divergencies and uncertainties beginning when one passes from the clinical picture to the pathogenetic interpretation. There are those who attribute its cause to arterial and arteriolar lesions, above all, productive endarteritis; those who attribute it to a fundamental capillary lesion; those who believe in an injurious action by the radiations on the nervous vasomotor apparatus and therefore, in ultimate analysis, again to an action on the circulation although it is indirect. Others believe it is due to technical error, overdosage, but in this case one must still explain how the lesion is initiated. Others speak of an elective caustic action by the radiations, giving importance also to cofactors such as trauma and infection. Ewing has a similar theory, but calls attention to the contemporaneous vascular lesions.

Bjorne Dahl recently proposed a new interpretation, concluding that the epidermal cells and piliferous follicles are destroyed by the radiations which also damage the connective tissue and the capillaries and induce a paralysis in the capacity of these elements to repair and proliferate. Secondarily, when the epidermis is separated one has a vascular reaction which reaches its maximum in the corium, where one observes an imposing capillary dilatation with the formation of an edema in contrast. This edema blocks the blood circulation of the denuded connective tissue and therefore leads to mortification by asphyxia. The necrosis can therefore deepen irregularly bringing every new layer of tissue which becomes necrotic to the formation of edema and to the obstruction of the circulation in a deeper layer. In this way one establishes a vicious circle which is only interrupted when the connective tissue and vessels have recovered their capacity to form granulation tissue.

The author studied the histology of late radionecrosis in 27 cases to see if one could discover elements for orientation in the microscopic pictures of the lesions for the pathogenetic interpretation of the process. He believes that the beginning of radionecrosis is to be attributed to phenomena of vascular thrombosis which manifest themselves consequently by lesions determined by the radiations in the walls of the blood vessels.

The author feels that indubitably the blood vessels are among the most radiosensitive elements and that by consequence of radiation, even in a technically correct manner, the muscular layer always presents regressive phenomena and the intima productive phenomena. The radiations therefore come to injure the most important functional elements in the vascular wall (the muscular), from which contractility is derived and the intima which assures normal canalization. He describes the histological attempts at repair of this process in the vascular wall and concludes that the result of all this is a slowing down of the circulation in the vessels irradiated. In this connection, an injury of any nature which comes to act on a vessel so anatomically altered can with ease lead to the formation of a thrombus with sudden interruption of the blood supply to the vascular territory situated beneath it.

The author also states that stabilization of a sufficient collateral circulation is not permitted because all the vessels of the irradiated area present similar lesions, and that not even the cells of the tissue irradiated, which is deprived in all or in part of its circulation, are in their best condition of vitality and resistance.

This interpretation of radionecrosis explains the many particulars of the process—the reasons for the clean demarcation, clinical or histological, of the necrotic focus, which remains a focus of ischemic necrosis almost resembling an infarct. All of the zone which depends for its blood supply from the vessel or vessels thrombosed, not receiving a sufficient supply from the collateral circulation because of the vascular alterations of the same coexistent nature, must be a victim of regressive phenomena, while the surrounding tissue demarcates it cleanly.

G. ALBIN LIVA, M.D.

RADIUM

Caceres, E.: Treatment of Cutaneous Hemangioma with Radium. *Am. J. Roentg.*, 1946, 56: 523.

The present article is based on a study of 66 cases of hemangioma treated with radium at the Chicago Tumor Institute.

As a rule, hemangioma increases in size at a slower or faster rate during infancy. For this reason, and since radiosensitivity is greatest early in life, treatment should be instituted within the first 6 months after birth. If there is a rapid increase in size or beginning ulceration, treatment of the hemangioma must be given immediately, even during the first weeks of life.

Of the various methods of treatment that can be used, the application of radium is believed to be the most satisfactory. The author limits his discussion to the technique and dosage with (1) filtered contact radium and (2) filtered radium at a distance (mold, plaque). The different types of radium applicators used at the Chicago Tumor Institute are briefly reviewed and the approximate dose with each is indicated.

The final result was excellent in 49 cases (74%), satisfactory in 13 cases (20%), and unsatisfactory in only 4 cases (6%).

Some photographs taken before treatment, and from 7 months to 2 years and 9 months after treatment are presented for the purpose of illustration.

T. LEUCUTIA, M.D.

MISCELLANEOUS

Taylor, H. C., Jr., and Twombly, G. H.: Cancer of the Cervix: A Study of the Effect of Interstitial Radon Needles as Compared with Roentgen Therapy Given through Intravaginal Cones. *Am. J. Roentg.*, 1946, 56: 513.

In a former report from the Memorial Hospital, New York, New York, the effect of the "massive" and "divided" roentgen irradiation on the five year results of carcinoma of the cervix was analyzed. The "massive" irradiation was carried out by administering 750 roentgens at a single treatment to each of 4 pelvic fields, with 200 kilovolts and 0.5 mm. of copper at 50 cm. skin target distance. In the divided irradiation, 12 treatments of 200 roentgens each were given to each of 6 pelvic fields, with 200 kilovolts, 0.5 mm. of copper at 70 cm. skin target distance. Both methods were supplemented with the same type of radium application; i.e., 2 intracervical capsules delivering 3,000 mc. hr., and 1 vaginal bomb delivering 1,500 mc. hr. The five year cures amounted to 30.2 per cent and 36.1 per cent respectively, proving that the divided dose technique of external roentgen irradiation has certain advantages over the massive dose technique.

In the present report, this study is being carried one step further. All cases of cancer of the cervix examined during the period from 1943 to 1944 were divided into two equal and comparable groups. One group was treated by replacing the vaginal bomb (but not the intracervical capsules) with intravaginal roentgen therapy, and the other by replacing it with interstitial radon needles which were introduced directly into the parametria through the vaginal vault. The external roentgen was given in both instances with the divided dose technique.

In the first group, the intravaginal roentgen therapy was carried out with 120 kilovolts, 3 mm. aluminum, at 35 cm. skin target distance. Special lead-lined brass cones were used which were inserted by means of an obturator into the vaginal canal with the patient's legs in stirrups. In the typical plan the intravaginal treatment was given 3 times a week during the course of the external roentgen irradiation and before the intracervical application of the radium. Three fields were used, one (4 cm. in diameter) directly to the cervix, and one each (3 cm. in diameter) to each parametrium through the lateral vaginal fornices, at an angle of 30 degrees from the long axis of the body. The dose on the cervix amounted to 4 exposures of 500 roentgens in air (total 2,000 roentgens), and on each parametrium to 4 exposures of 750 roentgens in air (total 3,000 roentgens). Not infrequently, the typical plan could not be followed. In such instances, adjustments based on individual requirements were made.

In the second group, the interstitial radon needles were inserted at the time of the intracervical radium application (consisting in this instance of a radon tandem) which, as a rule, was 2 weeks after the completion of the external roentgen irradiation. The plan of Nolan and Quimby was followed, which is described in detail. The intracervical tandem and the parametrial needles were left *in situ* until a total dose of 6,000 mc. hr., 3,000 mc. hr. from the tandem, and 3,000 mc. hr. from the needles, had been delivered.

Although the time of observation was too short (from 9 to 34 months), the superiority of the first method over that of the second cannot be doubted. Thus, the percentage of cases apparently free of cancer, when intravaginal roentgen therapy was applied, was 48 (54 of 113 cases), whereas with interstitial needles it was only 26 (26 of 94 cases). Furthermore, the patients treated with needles had more severe immediate reactions (diarrhea, dysuria, bleeding) and a larger incidence of late sequelae (stricture, fistula) than did those treated with intravaginal roentgen therapy.

The conclusion is reached that the use of interstitial radon needles in cancer of the cervix is ineffective and dangerous. The intravaginal roentgen therapy, in this respect, seems to have a definite advantage, but one should wait for the 5 year results before expressing an opinion also on the relative value as compared to that of the vaginal radium bomb.

T. LEUCUTIA, M.D.

Blomfield, G. W., and Spiers, F. W.: Dose Measurement in Beta-Ray Therapy. *Brit. J. Radiol.*, 1946, 19: 349.

The early use of beta-ray plaques was largely on an empirical basis, since the biological effect was not directly proportional to the ratio of milligrams of radium to the area in square centimeters. The present improved construction of the plaques plus standardization of the determination of the beta-ray output of the individual plaques should place this form of therapy on a more exact basis.

The authors have calibrated 2 plaques by means of a specially constructed ionization chamber. The chamber was standardized by calculation of the capacity and the volume and by conversion of the unit into a γ-ray chamber, then by a known quantity of radium determining the capacity and volume. A factor of 55 (capacity/volume) was thought to be the best obtained for conversion of the potential change due to beta-ray ionization to e.s.u./c.c. (roentgens). Plaque LGI 20 containing 20.4 mgm. of radium distributed in a 4 sq. cm. area with 0.10 mm. of monel filter had an aluminum H.V.L. of 0.23 mm. and a surface dose rate of 5450 r/hr. Plaque LGI 30 containing 31.0 mgm. of radium distributed in a 6 sq. cm. area with 0.10 mm. of monel filter had a H.V.L. of 0.35 mm. of aluminum and a surface dose rate of

4700 r/hr. The addition of 0.02 mm. of aluminum filter to plaque LGI 20 reduced the dose rate to 4550 r/min. and increased the H.V.L. to 0.33 mm. of aluminum, which indicates the extreme sensitivity of beta-ray plaques to filtration. The γ-rays contribute only from 3 to 4 per cent of the total dose rate.

The relative fall in dose rate with increase in distance between the plaque and the phantom is considerably less than predicted from the "inverse square law." This is thought to be due to the oblique filtration effect and must be taken into account in the application of plaques to certain anatomical sites.

The beta-ray dosage from plaque LGI 20 was measured independently by G. J. Neary at Mount Vernon Hospital with the apparatus which he had developed. (*British Empire Cancer Campaign Report*, 1943, and *Brit. J. Radiol.*, 1946, 19: 357.) The results were in excellent agreement with the values obtained by the authors at distances greater than 1.0 mm. At shorter distances it was thought the differences observed were due to the difference in the construction of the chambers. Smereker and Juris (*Strahlentherapie*, 1935, lii, 327) report values more than 50 per cent higher than the author's. However, the former standardized their chamber with 9–12 k.v. grenz rays having approximately the same H.V.L. as the plaques. Such a calibration is questioned due to the extreme difference in energies of the x-rays and the beta-radiation.

If a plaque is used as a "bomb," the surface dose and the field distribution is considerably improved by the addition of a 1.0 mm. lead elliptical "reflector." The surface dosage, however, is no greater than one would expect if the same quantity of radium were distributed in a plaque of the same (large) surface area. This method of treatment ("bomb"), while more convenient, is no more economical in radium.

The depth dose curve (in water) of beta-radiation corresponds approximately to 25 k.v. grenz rays. The H.V.L. is 1.3 mm. of water.

Small rodent ulcers are first curetted, then given a surface dose of 7000 r. (2 mm. depth dose of 2,500 r) at a single seance. Portwine stains are given 1000 r. at 2 or 4 week intervals for a total of 3000 r. Special mention is made of this form of therapy for early superficial rodent ulcers of the inner canthus overlying the lacrymal sac. Adequate dosage can be administered to the ulcer with little or no damage to the lacrymal apparatus. Recurrent rodent ulcers, skin nodules from carcinoma of the breast, and cavernous angiomas are considered too deep for this form of therapy.

The beta-ray plaque is of value in the treatment of superficial lesions. Any lesion requiring more than a 30 per cent depth dose at a depth of 0.25 cm. should be treated by some other method.

R. B. Lewis, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Imperati, L., D'Errico, G., and Ruggiero, A.: The Study of Operative Trauma as a Factor in the Production of Shock (Ricerche sul trauma operatorio quale fattore di squasso). *Gior. ital. chir.*, 1946, 2: 365.

A study of hemodynamic changes following operative trauma in 20 patients brings the authors to the following conclusions:

A marked fall of the systolic pressure indicates postoperative shock but a normal or increased systolic pressure does not exclude the presence of compensated shock. A fall of the differential pressure and of the oscillometric index serves as a sign of latent or compensated shock. Differential pressure expresses the energy of the contraction of the heart, with peripheral resistance on one hand and contractility of the blood vessels on the other. A fall of the venous pressure is an early sign of shock, especially of compensated shock, and particularly if a sharp fall of the systolic pressure takes place. On the other hand, a fall of the differential pressure and of the oscillometric index reveals the presence of latent shock.

The author applies the term "compensated or latent shock" to impending shock.

An accelerated absorption by operated patients of an intradermal wheal produced by the injection of 0.2 c.c. of saline solution is related to an increased permeability of the capillaries and to dehydration of the tissues.

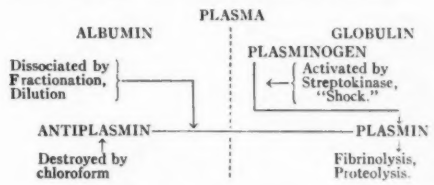
JOSEPH K. NARAT, M.D.

Macfarlane, R. G., and Pilling, J.: Observations on Fibrinolysis: Plasminogen, Plasmin, and Antiplasmin Content of Human Blood. *Lancet*, Lond., 1946, 2: 562.

The clots formed by normal whole blood, or by recalcified citrated or oxalated plasma, will remain intact in their own serum for days, or even weeks, if bacterial growth is prevented. Under certain circumstances, however, this stability is lost, so that soon after coagulation they break up and disappear. This phenomenon called "fibrinolysis" has been, until recently, mainly of academic interest: now there are indications that it may prove to be a manifestation of a fundamental physiological process.

Fibrinolysis has been produced experimentally in dogs by hepatectomy and peptone shock, and by treatment of plasma with chloroform *in vitro*. The latter was considered as being formed from the digestion of fibrin by the proteolytic action of thrombin. Some observers, however, think that another enzyme related to trypsin is responsible for the reaction. Still others consider it an enzyme associated with the globulin of the plasma, and suggested the name "plasmin;" "plasminogen" is the name given to its inactive precursor, and, in the familiar culture filtrates of certain strains of Bacillus hemolytic streptococci, "streptokinase" has been ascribed to the bacterial activator.

A fourth component, however, has been added to these, inasmuch as normal plasma or serum contains an antiproteolytic factor associated with the albumin fraction. It is probably concerned with the absence of fibrinolysis in normal blood and has been designated "antiplasmin." The following schematic diagram shows the interrelation of the components.



The recognition of these components of a proteolytic system existing in normal blood greatly facilitates an approach to the problem of spontaneous fibrinolysis in man. It is most probable that the disappearance of fibrin in blood taken after sudden death (Yudin, 1936), trauma (Macfarlane, 1937), or burns and hemorrhage (Tagnon *et al.*, 1946), is due to the activation of this system.

The possible significance of such a process becomes the more apparent when it is realized that the plasminogen of normal blood is of a potential activity sufficient to destroy the total fibrinogen of the body in a few minutes, and the more interesting since it is apparently associated with the problematical condition of "shock." Further investigation is desirable, and might be divided into studies of three aspects of the problem: first, the interaction of the plasma factors culminating in fibrinolysis; secondly, the nature of the physiological process that activates the proteolytic system; and thirdly, the effect on the living subject of the proteolytic enzyme when it is present in the blood stream.

The experimental technique for the quantitative assay of plasmin is described and the interrelations of plasminogen, antiplasmin, and plasmin are recorded in table form.

From the experiments, it appears that normal plasma contains at least three factors concerned in fibrinolysis. In the "globulin fraction" is a certain amount of active plasmin, and a further quantity of its precursor, plasminogen. It might be argued that the activity observed in this fraction was induced by the technique of separation, but, since it is lost on recombination with albumin, it is reasonable to suppose that this proportion of plasmin exists in normal blood in combination with the antiplasmin of the albumin fraction. If this is so, the combination is a

loose one, being broken by fractionation. Moreover, if the plasmin content of plasma is for any reason increased, fibrinolytic activity first becomes apparent in the higher dilutions of the plasma, suggesting that dilution favors dissociation of the plasmin-antiplasmin complex, though in normal plasma there is a sufficient excess of inhibitor to prevent activation.

It is an alteration of the plasmin-antiplasmin balance, therefore, that determines the presence or absence of fibrinolysis activity in the blood. Alterations resulting in an increased activity have been observed as follows:

1. Streptokinase increases the plasmin content of the plasma by activating available plasminogen, but does not appear greatly to affect the antiplasmin.
2. Chloroform destroys antiplasmin, thus releasing the plasmin normally in combination with it.
3. The spontaneous fibrinolytic activity observed in the authors' subjects is due to an increase in plasmin and also, apparently, to a decrease in antiplasmin.

The mechanism by which plasminogen is activated in these subjects is at present unknown.

STEPHEN A. ZIEMAN, M.D.

Levenson, S. M., Green, R. W., Taylor, F. H. L., Robinson, P., and Others: Ascorbic Acid, Riboflavin, Thiamin, and Nicotinic Acid in Relation to Severe Injury, Hemorrhage, and Infection in the Human. *Ann. Surg.*, 1946, 124: 840.

Few careful studies other than those of ascorbic acid and vitamin K in relation to surgical conditions have been reported in the field of vitamin therapy. In the meantime all known vitamins are being used in the care of surgical patients, with increasing frequency and in increasing doses.

Recent work in the laboratory has shown that many vitamins play much more fundamental roles in the animal organism than that of merely preventing or curing the well known syndromes of scurvy, beriberi, pellagra, or hypoprothrombinemia. For instance, thiamin and nicotinic acid both play fundamental roles in the enzyme systems that control the metabolism of carbohydrates. Riboflavin is also important for the carbohydrate metabolism and, in addition, has a function associated with aminoacid metabolism. Ascorbic acid is said to have a fundamental role in the formation of adrenocortical hormone. These functions indicate that these four vitamins play important roles in connection with recovery from shock, injury, and acute infections since disturbances in the metabolism of carbohydrate, protein, and of adrenocortical hormones are caused by these conditions.

The authors present data concerning 6 patients with severe injuries, hemorrhage, or infection, who had marked abnormalities in the metabolism of ascorbic acid, thiamin, riboflavin, and nicotinamide. They were cared for by the members of the "Burn Assignment" in a metabolic ward which was supplied with special nurses, a research dietician, and facilities for accurate determinations of vitamins as developed in the Harvard Fatigue Laboratory. Low concentration of ascorbic acid in the plasma, fasting or after saturation tests, and low excretions of all four vitamins under the same two conditions were found.

The study gives some further support to the idea that large doses of ascorbic acid, thiamin, riboflavin, and nicotinic acid may serve a useful purpose in the care of acutely ill people. HARRY W. FINK, M.D.

Slobe, F. W.: Fibromyositis, Including Its Industrial Implications and with Special Reference to Referred Pain. *Occup. M.*, 1946, 2: 329.

Fibromyositis includes conditions in which myositis (which is often an intramuscular fibrositis) and fibrositis, or both, predominate. It presents a localized or occasionally diffuse area of infiltration involving muscle or contiguous tissue. The observed pathological changes are inflammatory and minimal in the acute stage, but fibrosing and degenerative in the chronic stage. Firm, painful nodules, designated by the term "myogelosis," may occur in the affected muscle. The usual sites of involvement are the erector spinae muscles, extending from the neck to the pelvis, the glutei, and the muscles attaching to the shoulder girdle.

The mechanisms producing the symptoms of the disease are poorly understood, but many predisposing and associated factors are recognized. These include nutritional deficiencies, metabolic disturbances, foci of infection, fatigue, postural defects, exposure, and constant repetition of given motions (as in the use of a screwdriver). The signs and symptoms may be difficult to elicit. In this respect a complete history is invaluable. Typically there is tenderness at the site of involvement with pain which is aggravated by use of the part, and often with referred pain which is greater than that felt in the primary site. Objectively, the only finding may be an area of induration or muscle spasm. On occasion, a firm nodule may even be felt. In some cases, however, overlying muscles may obscure these findings. Isolation of the small area of tenderness which represents the primary site is so important as to justify a painstaking search. In making the diagnosis of fibromyositis, one is called upon to differentiate the condition from a strain of a ligament or muscle. The "pure" strain will give immediate pain experienced simultaneously with an incident or effort which is unusual and definite. It will produce some degree of immediate local incapacity and impairment of function. Under appropriate therapy its symptoms will subside. The "pure" instances of fibromyositis are those in which there is history of unusual effort for some time before the appearance of symptoms. There are "mixed" cases in which an acute strain may precipitate the symptoms of a fibromyositis, to which there has been a predisposition because of unusual heavy work, prolonged overuse of a part, or work in an unnatural position.

One of the most interesting features of this disease is the frequent occurrence of referred pain. This always arises from deeper structures, whether they be muscles, ligaments, fascia, or even periosteum. It is diffuse and poorly localized pain which follows the dis-

tribution of a spinal segment. There is usually tenderness of the area to which the pain is referred. Although objective sensory changes may be absent, there frequently is slight diminution or increase in sensibility to light touch and pinprick. The patient may be able only to describe the area as "feeling different" or "tight." The referred pain originates in the primary site of the disease, but how this "trigger zone" initiates it is not definitely known. Several interesting theories are advanced. The author describes in detail the characteristics of referred pain from the most frequent sites of origin: the dorsolumbar region, the lower part of the back, the shoulder girdle, and the upper dorsal region, and the cervical region.

Treatment is prophylactic to some extent, especially in industry, where instruction in proper methods of lifting, avoidance of prolonged repetition of motions, and correction of working positions which are mechanically unsound will eliminate certain predisposing factors. Specific therapy includes rest for the affected part, the application of heat, the local use of counter-irritants, deep massage, and the use of analgesics, particularly of the salicylates. The injection of a local anesthetic into the "trigger zone" is a striking therapeutic procedure and frequently has diagnostic value.

The author recommends that the small isolated tender zone be injected with from 5 to 20 c.c. of 1 per cent procaine hydrochloride. He advocates injecting half of the solution rather rapidly. If this increases the referred pain one may feel certain that the lesion is the primary one. The remainder of the solution should be injected slowly around the periphery of the area. The treatment is effective in most cases, but not all patients respond favorably. Some may experience severe "after pain." B. F. Lounsbury, M.D.

Coman, D. R.: Induction of Neoplasia in Vitro with a Virus. Experiments with Rabbit Skin Grown in Tissue Culture and Treated with Shope Papilloma Virus. *Cancer Res.*, 1946, 6: 602.

Since neoplasia has been induced in tissue cultures by a chemical carcinogen, the question presented itself as to whether similar neoplastic transformation of cells in vitro can be obtained by other types of carcinogens such as viruses. The author designed experiments to determine whether neoplasia can be induced in tissue cultures of rabbit skin by papilloma virus.

The following criteria were adopted for the induction of neoplasia: (1). increased growth activity of the epithelial cells in cultures after the introduction of papilloma virus, and (2) the formation of relatively large tumors in the liver of the rabbit following the implantation of such tissue cultures. Both criteria were met by the author's experiments and he therefore concludes that papilloma virus is capable of inducing neoplastic formations in vitro, namely, in tissue cultures of rabbit skin

Tumors resulted in the author's experiments only when the skin treated with papilloma virus was implanted in the rabbit from which it had been removed originally. This indicates that the skin had not lost its individual specificity during tissue culture.

The use of papilloma virus and rabbit skin in vitro should serve as an excellent method for investigations of virus-cell relationships.

Joseph K. Narat, M.D.

Burrows, H., and Hoch-Ligeti, C.: Effect of Progesterone on the Development of Mammary Cancer in C3H Mice. *Cancer Res.*, 1946, 6: 608.

The effect of progesterone on the incidence of spontaneous mammary tumors in the pure strain of mice was investigated by the authors because it had been previously found that the occurrence of mammary cancer in RIII mice was considerably reduced by progesterone, and because it has been repeatedly suggested that, in addition to the hereditary factors in pure strain mice with a high incidence of mammary cancer, an excessive secretion of estrogen may determine the incidence of these tumors.

Thirty mice of a high mammary cancer strain were given subcutaneous injections of 1 mgm. of progesterone weekly. The authors were not able to establish any differences in the frequency of the tumors and the ages of these mice and of the 20 control animals receiving injections of the solvent only.

The different results obtained by other writers in similar experiments demonstrate the need for care in attempting to generalize the results in different strains of the same species. Obviously still greater care is indicated in attempts to carry over the results obtained in experimental animals to human pathology. Joseph K. Narat, M.D.

GENERAL BACTERIAL, PROTOZOAN, AND PARASITIC INFECTIONS

Hartman, T. L.: Sulfonamide Sensitivity Determinations of Hemolytic Streptococci Isolated from Patients before and after Treatment with Sulfadiazine. *Bull. Johns Hopkins Hosp.*, 1946, 79: 342.

Recent epidemics of streptococcal infections caused by sulfadiazine-resistant hemolytic streptococci following mass chemoprophylaxis programs have aroused interest in this problem.

Nasopharyngeal cultures were taken from 40 patients on admission to the hospital and following sulfadiazine therapy. With 1 exception all of these 40 developed clinical evidence of scarlet fever. The bacteria were typed by the precipitin method. Thirty-nine cases presented group A hemolytic streptococci, which were predominant in 19 cases, and 1 case presented those of group C. Sulfadiazine was given as follows; 2.0 gm. initially, 1.0 gm. every 4 hours for at least 4 doses during the first day, and 1.0 gm. every 4 hours for 5 doses during the succeeding days. Most patients sprayed their nose and throat with 2.5 per cent sulfadiazine in glycerine and saline solution, and gargled with 2 5 per cent sulfadiazine. The total amount of sulfadiazine given varied from 14 to 75 gm per pa-

tient, and resulted in blood levels from 2.0 to 12.0 mgm. per cent, with an average blood level of 7.3 mgm. per cent. After chemotherapy, sulfadiazine sensitivity of the streptococci was tested by the method described by Wilson. No significant resistance against sulfadiazine was found in any instance.

Previously noted resistance to sulfadiazine by hemolytic streptococci is explained by the lower doses of sulfadiazine used for prophylaxis, and the longer period of administration. Resistance to drugs by bacteria is hypothecated as being due to mutation or adaptation to unfavorable environmental conditions.

C. Frederick Kittle, M.D.

Lewis, L.: Therapeutic Trial of Penicillin in Tetanus. *Ann. Int. M.*, 1946, 25: 903.

Laboratory studies have indicated that penicillin is effective against the Clostridium tetani. Penicillin alone had not been critically evaluated in human tetanus infection. An opportunity for such observation in civilian casualties became available in the Okinawa campaign.

Patients with recently developed symptoms of severe tetanus, and who were not treated with or were unaffected by tetanus antitoxin were selected. Fifteen, of whom only 4 had received tetanus antitoxin were given penicillin; these 4 were included because they apparently had failed to benefit from the antitoxin. Nine patients had multiple shrapnel wounds, 4, gunshot wounds, 1 patient had undergone amputation of the right arm, and 1 had an undetermined injury; all of the patients had open, infected wounds. One patient received a local injection of penicillin, but all the others received the drug by the intramuscular route. About 20,000 units of penicillin were given every 4 hours, except from 10:00 P.M. to 6:00 A.M., when no trained nurses were on duty. The daily dose was, therefore, 100,000 units, and the average duration of treatment was 5 days. Most patients received a total of 500,000 units or more, and 1 patient was given 150,000 units in injections around her wounds. Of this group of 15 patients, 7 recovered, 3 were benefited (including the patient who received the local injection), and 5 died.

There was no sharp alteration of the clinical course noted during the penicillin treatment, nor immediately following the injections, although in most instances the local wounds became cleaner. The course of the tetanus infection seemed no different from that in the controls, who received only prophylactic antitoxin, and there was no evidence of a reduction of mortality in severe tetanus. There was no further improvement in cases which had failed to respond to antitoxin. In general, recovery and improvement were gradual.

Four patients who had received antitoxin, 2 of whom received large doses, showed a striking clinical inprovememt in contrast to the result obtained with penicillin.

Of 27 patients treated with small, probably inadequate amounts of antitoxin, 16 recovered completely, 7 were benefited, and 3 died.

On the basis of this study, the author concludes that there was no evidence of an effect of commercial penicillin against human tetanus infection. However, the dosage might have been inadequate, and therefore large booster doses, similar to those used in subacute bacterial endocarditis, should be tried. Also different fractions of penicillin will have to be analyzed.

Arthur J. Lesser, M.D.

Hoffman, R. S., Dingwall, J. A., and Andrus, W. DeW.: Studies on the Effects of Adult Animal Tissue Extracts on Wound Healing. *Ann. Surg.*, 1946, 124: 1125.

The process of repair proceeds through an ordinary sequence in healing. The work here presented is based on the assumption that this healing cycle may be accelerated. The authors prepared an extract of sterile adult sheep hearts which had been finely minced in a blender with Tyrode's solution, cooled, and centrifuged, the extract being decanted and kept refrigerated.

The authors used 5 human volunteers between the ages of 30 and 50 years in good nutritional state. Under novocain anesthesia and completely sterile precautions, wounds were made in both anterior thighs. After 48 hours the larger of the defects was selected for treatment with the extract, while the smaller one was treated by constant dakinization. There was no evidence of infection in either wound in any of the subjects studied, and at regular intervals the circumference of these wounds was measured. Four of the 5 treated wounds were healed before the controls and 1 healed simultaneously with the control. In the wounds that were somewhat deeper it was observed that the extract had a marked stimulating effect on the growth of granulation tissue.

In the discussion it is concluded that the nutritional state, the hematologic picture, metabolic diseases, and infection all influence the rate of healing of wounds. More recently there have been other growth-promoting properties mentioned in the literature, some of which are chlorophyl, allantoin, and creatine. Many of these substances, however, have not been proved to be active on cells growing in vitro, nor do some of the clinical cases treated meet the requirements necessary to draw conclusions.

The authors believe that extract of adult animal tissue contains a substance that exerts a growth-promoting effect, and that this effect is the result of direct action on the metabolic mechanism of cellular proliferation. It is not thermostabile and it is nondialyzable; its activity does not vary greatly with the change in *p*H, nor does it change appreciably over a wide range of concentration. It is thought that the active factor is most probably a protein, not necessarily a nucleoprotein, but rather an enzyme which plays a part in nucleoprotein formation. Exposure to ultraviolet light, and mixing with sulfadiazine or penicillin did not alter the growth-producing properties.

The article also includes a brief resumé of the method of preparation of the extract.

Louis T. Byars, M.D.

DUCTLESS GLANDS

Cesanelli, A.: The Surgical Treatment of Myasthenia Gravis (Tratamiento quirúrgico de la miastenia gravis). *Bol. Soc. cir. Rosario*, 1946, 13: 206.

The author has observed that extirpation of the thymus gland has shown the existence in certain cases of a relationship between this gland and the symptoms of myasthenia gravis. Thymectomy is indicated in patients with myasthenia gravis when a tumor of the thymus is demonstrated for in these cases the best results were obtained. Pneumomediastinal x-rays were of great diagnostic value in the visualization of small tumors of the thymus. In special cases with lack of demonstrable tumors and in which medical treatment fails, it is justifiable to operate, although in the acute crisis of myasthenia gravis surgery is contraindicated and the administration of prostigmine is necessary. In 1 of 2 patients who tolerated the operation it was possible to observe a definite improvement in the condition, and in the other the symptoms disappeared with apparent cure after a period of 9 months.

ARTHUR F. CIPOLLA, M.D.

SURGICAL PATHOLOGY AND DIAGNOSIS

Isaacson, N. H., and Rapoport, P.: Eosinophilia in Malignant Tumors; Its Significance. *Ann. Int. M.*, 1946, 25: 893.

The authors report 34 cases of pronounced eosinophilia associated with malignant tumors. Nineteen of these were reviewed from the literature and 15 were observed among 2,363 cases of malignant tumors at the Jewish Hospital of Brooklyn during the past 8 years. Six per cent of the total white count is considered the upper normal for eosinophile leucocytes. In the 19 case reports of eosinophilia with malignancy the eosinophil counts varied from 10 to 70 per cent. In the authors' 15 cases, the range was from 10 to 32 per cent, but in most of the cases it was between 12 and 15 per cent.

In 90 per cent of all cases, metastases were present. In 7, they were suspected but not proved and in 1 case they were neither demonstrable nor suspected. The authors believe, however, that eosinophilia is indicative of dissemination of the malignant process when it is associated with a malignant tumor and other causes are ruled out.

The following causes of eosinophilia in malignant tumors have been suggested: (1) necrosis of tumor tissue with eosinophilotactic response, (2) bone marrow metastases with stimulation of eosinophile production at these sites, (3) the pressure of metastases on the vagus with vagal reflex, (4) the connective tissue surrounding the tumor; and (5) a familial eosinophile predisposition with the response to foreign protein of the tumor cells as a provocative agent. There is no satisfactory theory of pathogenesis, and no definite cause for eosinophilia in malignant tumors has yet been established according to the authors.

FRANK B. QUEEN, M.D.

EXPERIMENTAL SURGERY

McCarthy, M. D., Parkins, W. M., and Zerbe, J. W.: Comparative Efficacy of Blood from Normal and from Burned Donors in Experimental Burns. *Arch. Surg.*, 1946, 53: 570.

The experiments reported by the authors lend credence to the popular hypothesis that severe burns produce a circulating toxin. Previous experiments had demonstrated that a single transfusion of blood from burned rats was not lethal to a normal rat in amounts up to 2 per cent its body weight. Therefore, it was decided to increase the potential sensitivity of the recipient animal to the hypothetical toxin contained in the donor blood by subjecting the recipient to a standardized burn before the transfusion.

Forty-eight rats were subjected to a standardized scalding burn of the back. Sixteen of these were not treated in any way. Sixteen were given an infusion of normal blood equivalent to 2 per cent of their body weight. Sixteen were given an equivalent infusion of blood withdrawn from burned rats. The donors had been subjected to a burn of 45 per cent of their body surfaces, which in every case proved fatal within 24 hours. Ten days after being burned the rats treated with normal blood had a survival rate of 100 per cent, and both the untreated group and that given "postburn" blood had a survival rate of 56 per cent. Hematocrit data obtained from the three groups did not indicate that increased mortality was a direct result of increased hemoconcentration.

To determine the culpable fraction of "postburn" blood, it was centrifuged and its cells suspended in normal saline solution. When this suspension was infused into burned animals, the survival rate (66%) was not significantly different from that of burned animals infused with suspensions of normal cells in saline solution (83%). This appeared to indicate that the cause of the ineffectiveness of whole "post-burn" blood lay in the plasma. The plasma potassium level of "postburn" blood was slightly higher than that of normal blood (33.1 mgm./100 c.c. as against 30.5 mgm.), but this difference was not significant. However, there was a significant difference in hemoglobinemia. This was 407 mgm./100 c.c. for "postburn" plasma as compared to 75.0 mgm. for normal plasma.

The authors emphasize that blood from severely burned rats was completely ineffective when transfused into rats subjected to a standardized burn sufficiently severe to give a 44 per cent mortality in the untreated controls. The fact that other rats subjected to the same burn but transfused with normal blood had a 0 per cent mortality is statistically significant.

B. F. LOUNSBURY, M.D.

Jenkins, H. P., and Janda, R.: Studies on the Use of Gelatin Sponge or Foam as a Hemostatic Agent in Experimental Liver Resections and Injuries to Large Veins. *Ann. Surg.*, 1946, 124: 952.

In a series of 12 dogs operated on with aseptic technique and under ether anesthesia, a considerable

portion of a lobe of the liver was resected by simply cutting it off with scissors. The gelatin sponge was prepared for use by moistening it in physiological saline solution, expressing the air, and removing the excess saline solution by compressing it between dry gauze. The large gelatin sponge was then placed over the freely bleeding stump of liver so that it overlapped the upper and lower surface of the liver. It was held in place with firm pressure for from 5 to 10 minutes. Good apposition of the sponge to the bleeding surface is necessary, as this produces a relatively rapid adhesive effect between the raw surface of the liver and the sponge. In all of the animals, hemostasis was obtained by the application of the gelatin sponge alone, without supplementary suturing. In several instances it was necessary to reapply a fresh gelatin sponge in order to obtain complete hemostasis.

In a series of 36 dogs, operated on in a similar manner, the femoral, jugular, or renal vein, or the vena cava was exposed. A stab incision was made with a scalpel, or a portion of the wall of the vein was excised. The gelatin sponge was applied immediately to the bleeding vein and pressed firmly in place over the wound for a minute or two. It was found that pressure with the gloved finger directly on the sponge on the vein was satisfactory. The bleeding was completely controlled by this method in all the experiments but 2. In 1 case, secondary hemorrhage occurred from the superior vena cava, apparently because of dislodgment of the sponge after the chest wound was closed.

Gelatin sponge was also used on 76 patients in whom troublesome bleeding could not be completely controlled by other means. The extent of the bleeding in these clinical cases cannot be compared with that obtained in the experimental animals, so that the value of gelatin sponge as a clinical hemostatic has yet to be demonstrated.

A substantial part of the hemostatic action of gelatin sponge may be due to the spongy material itself. It is possible that the enormous surface area of the myriads of interstices may attract and damage the platelets, and thus liberate thromboplastin. This, in combination with the calcium and prothrombin in the blood, may elaborate enough thrombin to initiate the clotting mechanism. In the clinical use of gelatin sponge it is recommended that thrombin be used to obtain the maximum hemostatic effect.

Although the absorption time of the sponge used may be more than adequate under favorable conditions, the sponge may be rapidly liquefied in the presence of a large concentration of leucocytes. A somewhat tougher and stronger spongy material than is now available seems to be desirable. This would make it possible to suture the sponge in place by some sort of basting stitch.

The excellent protective cover which the sponge appears to offer to the healing process across the stump of the liver at the line of resection is of considerable interest, as is also the structural support it seems to give to the reparative process.

The possibility that a propagating thrombus may arise from the sponge plugging a rent in a vein must be considered in the clinical application of this experimental work. Heparin and dicoumarol therapy may be required to prevent this.

The particular promise which such hemostatic substances offer is that they may make possible more extensive surgery with greater safety, especially in the treatment of carcinoma, than has been feasible in the past.

SAMUEL KAHN, M.D.